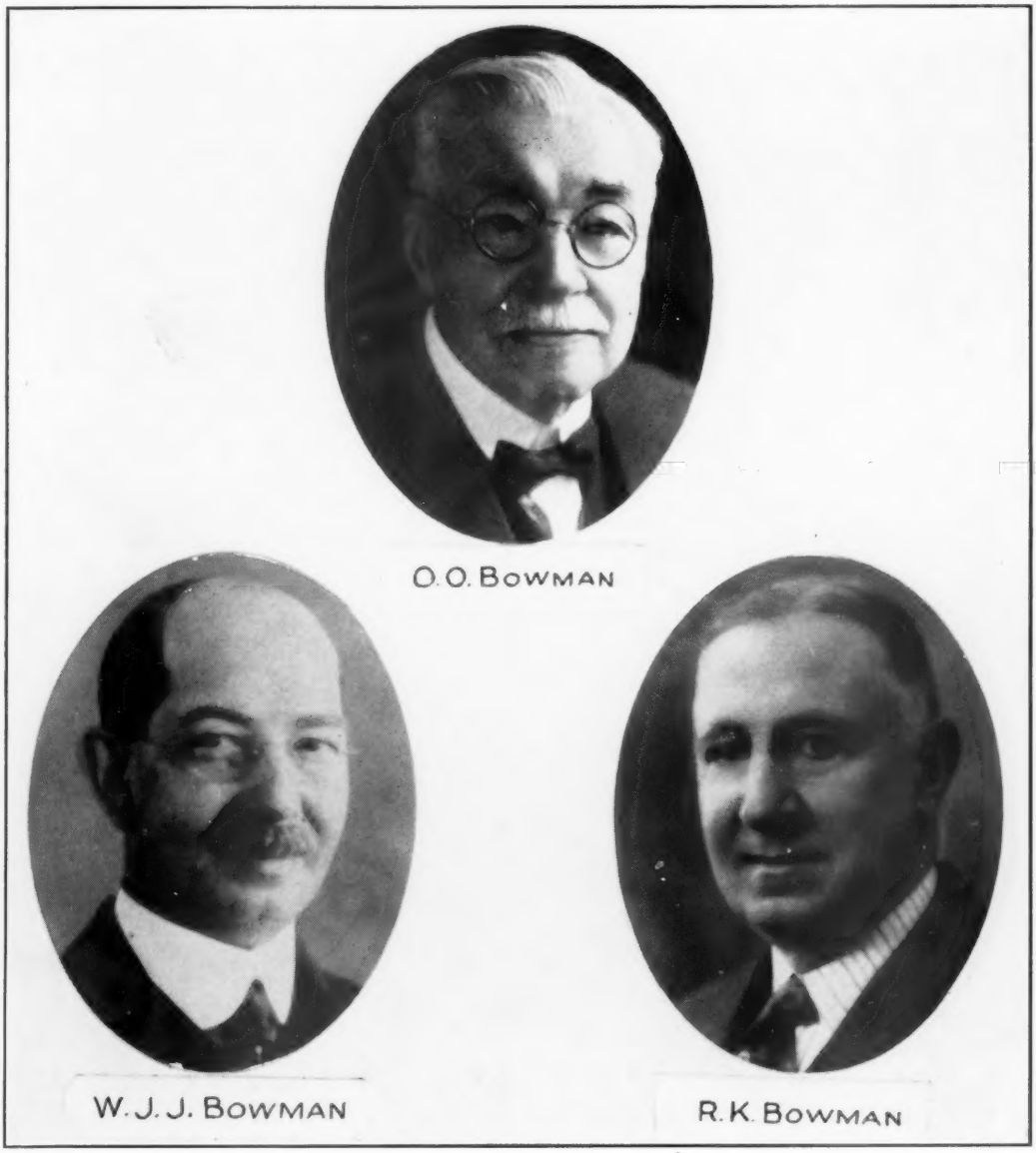
THE BULLETIN

OF THE

AMERICAN CERAMIC SOCIETY

Volume 19 | MAY, 1940 | Number 5



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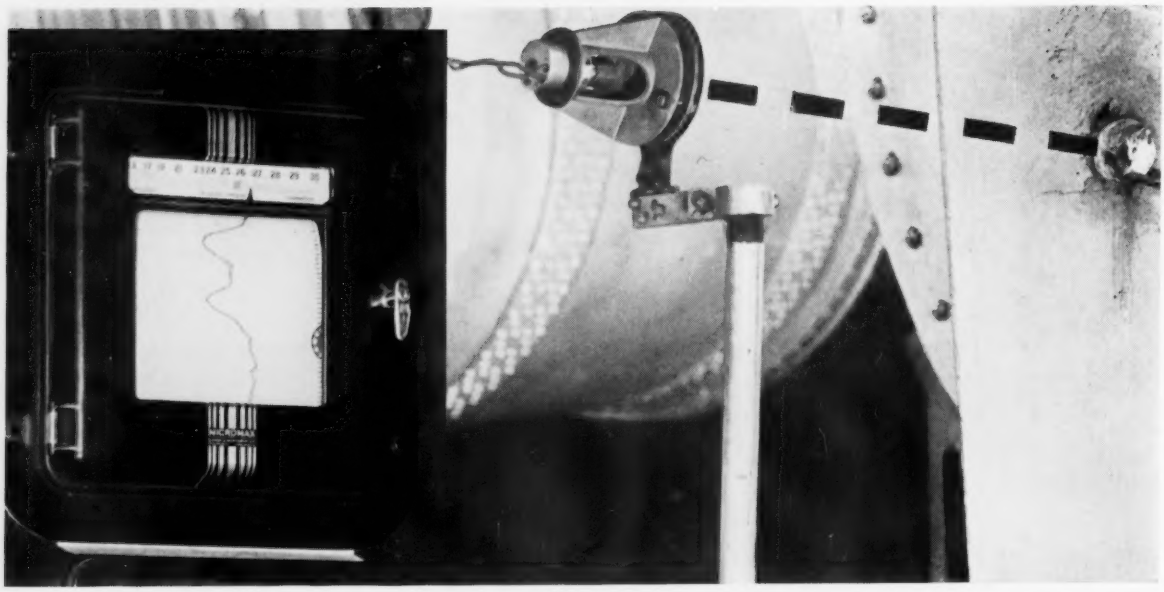
W. J. J. BOWMAN

R. K. BOWMAN

For story, see pages 175–77



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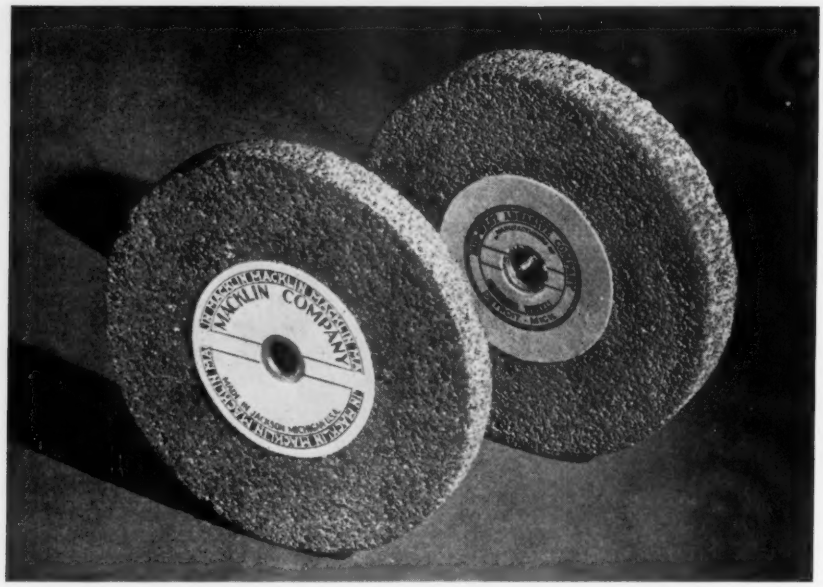

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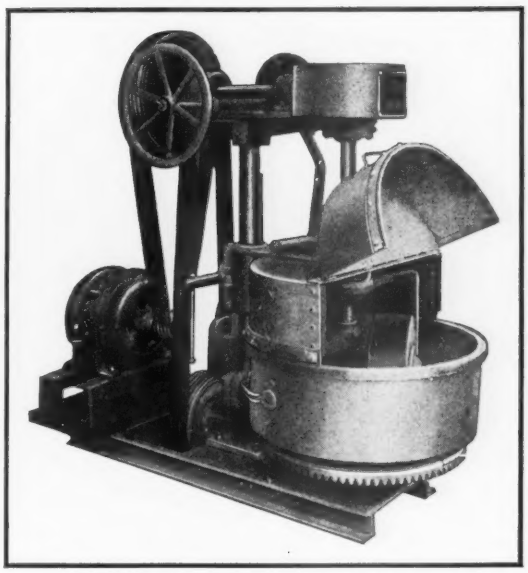

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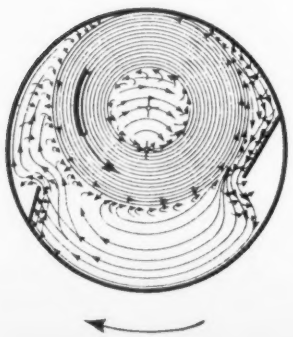

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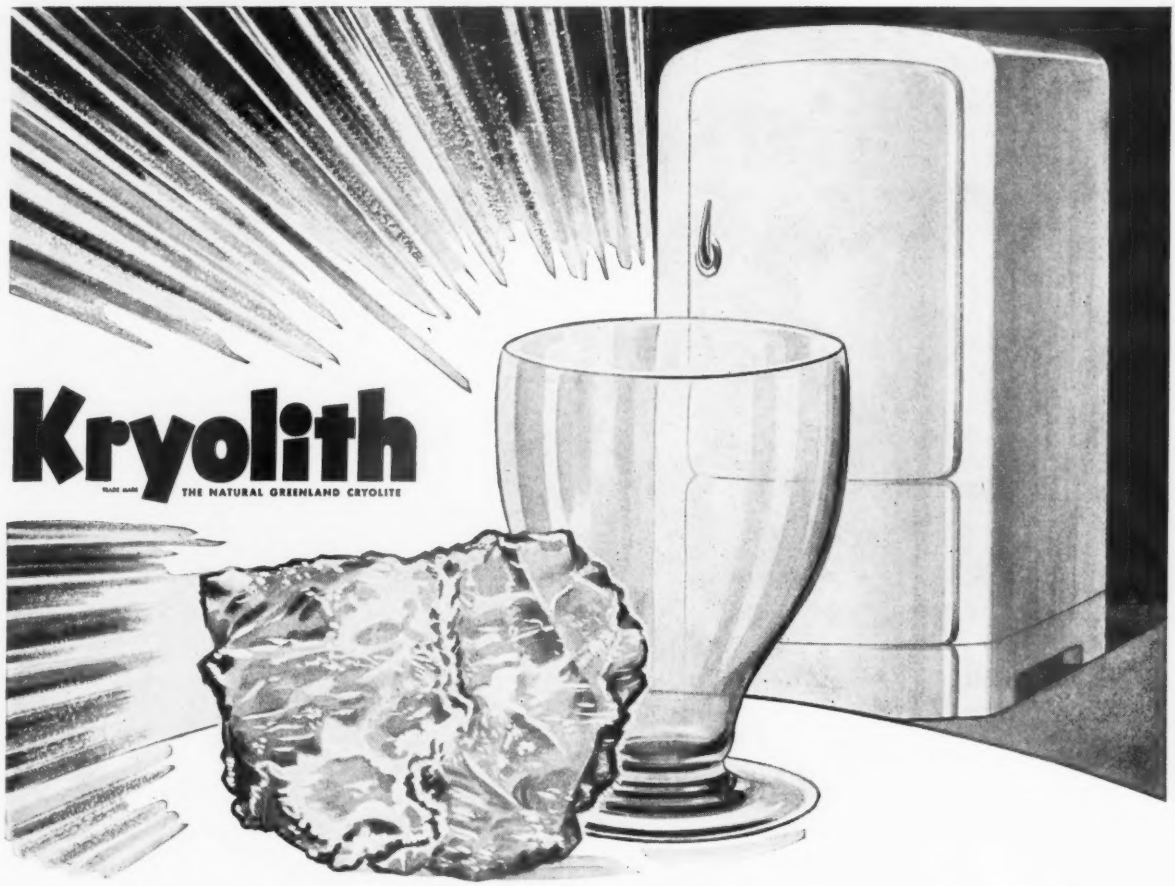

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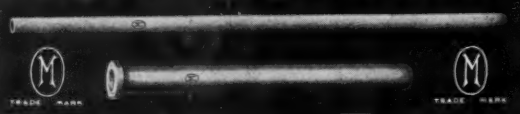

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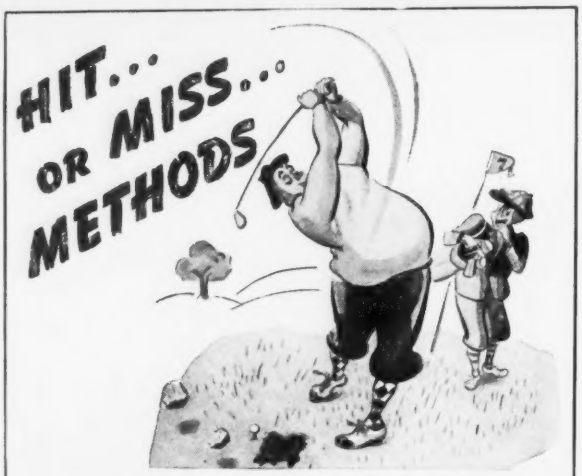

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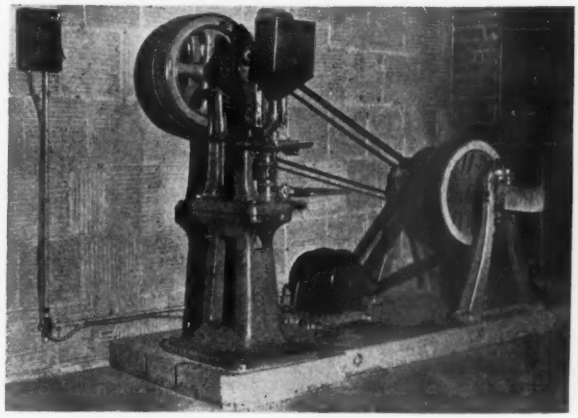

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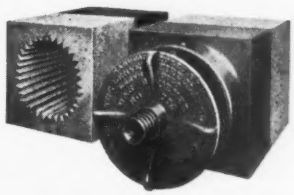

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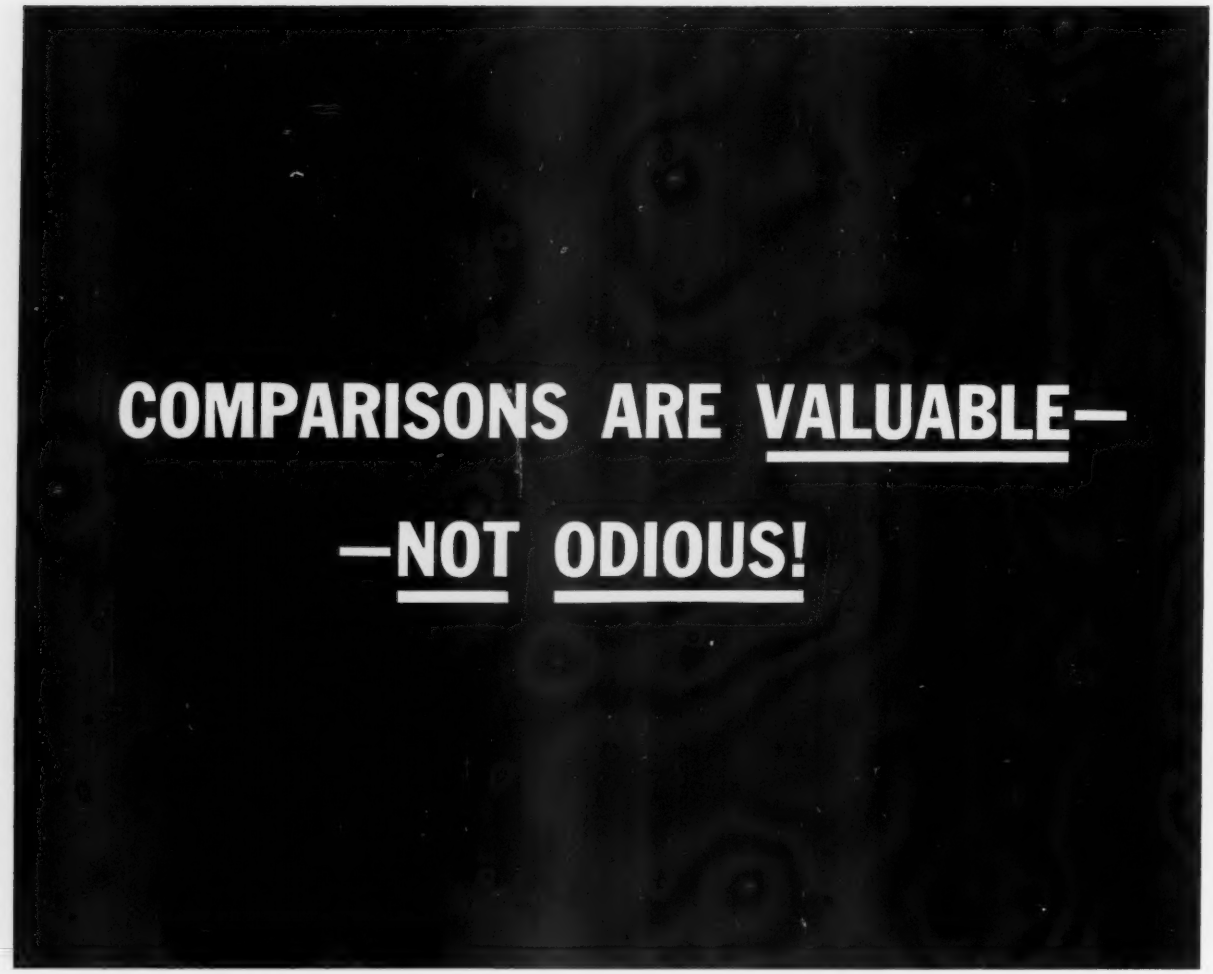

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PAPERS

BERYL, A CASE HISTORY*

By L. G. Bliss

Abstract

The author presents a brief history, sources, and production of beryl, and its use in ceramic bodies and glazes. A glaze composition containing beryl is also given.

I. Introduction

The importance of beryl in ceramics was established before 1920 but little research has been contributed toward its use in the ceramic industry. Beryl, however, in isolated cases has rendered excellent service.

Beryllium, which is derived from beryl, is often inaccurately termed a rare element. Clark and Washington[1] place beryllium actually in position No. 35 with a factor of 0.001%, and it is really ten times as abundant as such well-known members of the atomic table as molybdenum, arsenic, antimony, and tin. It has been known for more than one hundred years, and its availability in the lithosphere has been known for more than forty years.

There are seventeen authenticated minerals of beryllium, but beryl, a beryllium aluminum silicate, is the only commercial source of the element.

Two reasons for the slow progress in the mining and application of beryl are (1) that it occurs erratically and sparsely and is usually mined as a by-product in the production of feldspar and other minerals and therefore has not been profitable to win independently and (2) that it is not constant in composition.

Only five hundred tons of beryl were used in the United States in 1937. Should the demand ever exceed the supply, concentration investigations would progress rapidly. Richer deposits would be searched for and more economical methods of concentration might be developed.

Beryl is found in a wide variety of colors, ranging from blue to green, yellow, and pink, but sometimes it is colorless. It usually occurs in crystalline forms that are long and prismatic and oftentimes striated vertically. Distinct terminations are exceptional, and it is rarely tabular in habit. Dana[2] reports that it occurs occasionally in large masses, coarse columnar or granular to compact.

The cleavage is c' imperfect and indistinct. The fracture is conchoidal to uneven. It is brittle, and its hardness on Mohs' scale is 7.5 to 8.0; specific gravity, 2.63 to 2.91; and index of refraction, 1.581 to 1.575. Empirically, the composition of beryl is $Be_3Al_2Si_6O_{18}$ or $3BeO \cdot Al_2O_3 \cdot 6SiO_2$; a theoretical analysis is given as silica 67, Al_2O_3 19, and BeO 14%.

Commercially, the ore contains from 10 to 12% BeO. The difference of 2 to 4% between the theoretical and actual percentage is composed of alkali and the alkaline-earth group oxides. A few typical analyses of beryl, originating from various parts of the world, have been listed by Dana.

II. Sources and Production

Beryl is found in the New England States and in Pennsylvania, Virginia, Alabama, Colorado, and South Dakota. Large deposits of beryl occasionally have been reported in these localities of sufficient size to warrant their operation solely as beryl mines, but usually the deposits that appeared to be well-defined veins were only large pockets.

Beryl is found in the Black Hills as an accessory mineral in pegmatites, the bulk of which is obtained as a by-product in mining feldspar, amblygonite, spodumene, and lepidolite. From 1914 to 1933, this region produced 391 tons of beryl, but about 20,000 tons of dike material were mined to obtain this amount. Theoretically, fifty tons of feldspar, worth $3.00 to $6.00 per ton, must be mined to win one ton of beryl,

* Presented at the Autumn Meeting of the Materials and Equipment and White Wares Divisions, Summit Hotel, Uniontown, Pa., September 16, 1939. Received September 29, 1939.

[1] F. W. Clarke and H. S. Washington, "Composition of the Earth's Crust" (Relative Abundance Tables), *U. S. Geol. Surv. Prof. Paper*, No. 127, 117 pp. (1924).

[2] J. D. Dana, A System of Mineralogy, 6th ed., p. 408. John Wiley & Sons, Inc., New York, N. Y., 1909. 1134 pp.

which is worth $30.00 to $40.00 in lump form at the mines.

Many of the mines are worked systematically, and because beryl is an actual by-product, the price remains within reason despite the fact that it is produced on a comparatively small scale. With a large demand, a systematic and economical mining operation undoubtedly would evolve to take beryl out of the by-product class, particularly if the froth-flotation process should be as successful commercially as it has been experimentally.

Perhaps a larger demand for beryllium oxide would also stimulate the development of some of the more promising of the lesser known beryllium minerals. Phenacite, which is a beryllium silicate (Be_2SiO_4), analyzes much higher in beryllium oxide than beryl, showing 54.45% SiO_2 and 45.46% BeO. Phenacite has been found in Brazil and in Durango, Mexico, as well as in Switzerland, Colorado, and New Hampshire.

Although beryllium oxide sold at one time for $10.00 per pound, it is now available at a figure substantially lower than one-third of that cost, and there are indications that a larger demand in the ceramic field would reduce the price still further.

III. Use of Beryl in the Ceramic Industry

(1) Bodies

According to work of Fessler and Navratiel,[3] beryl effects the formation of mullite ($3Al_2O_3 \cdot 2SiO_2$), thereby increasing the mechanical strength. Beryllium oxide is considered to be the best of the RO group in this respect.

Beryl adds resistance to thermal shock, owing to the high heat conductivity which it imparts to the body. It has a low coefficient of expansion, but when it is incorporated in certain bodies, this desirable property is partially lost.

Beryl, used discriminately in a porcelain body, will materially improve the dielectric strength, sometimes as much as 16.5%.

Beryl will also impart greater transverse strength and resistance to impact to a porcelain body.

(2) Glazes

The substitution of beryl for feldspar in a glaze will harden the glaze. One of its most unique properties is to develop high-temperature chrome greens. Several series of glazes differing only in the percentage of beryl and chromic oxide have been applied to a typical cone 10 body. The glaze composition is feldspar 43, whiting 15, clay 12, and flint 30%, with beryl replacing feldspar in increments of 5%. By such a replacement, the brown color, which is inherently characteristic of chrome, is completely eliminated when the beryl is increased to 20% at the expense of the feldspar. From 1 to 5% of Cr_2O_3 is used as the coloring oxide. It is difficult to make a pastel or chrome green at the higher cones without the use of beryl.

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[3] A. H. Fessler and H. Navratiel, "Effect of Different Fluxing Oxides on Constitution of Porcelain," *Jour. Amer. Ceram. Soc.*, **13** [5] 332–40 (1930); p. 336.

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(1) D. W. Luks, "Beryl and Ceramics," *Foote-Prints*, **10** [1] 1–11 (1937); *Ceram. Abs.*, **16** [9] 285 (1937).

(2) A. V. Bleininger and F. H. Riddle, "Special Spark-Plug Porcelains," *Jour. Amer. Ceram. Soc.*, **2** [7] 564–75 (1919).

(3) Robert Twells, Jr., "Beryl as a Constituent in High-Tension Insulator Porcelain," *ibid.*, **5** [5] 228–34 (1922).

(4) C. C. Treischel (General Electric Co.), "Porcelain," U. S. Pat. 1,462,396, July 17, 1923; *Ceram. Abs.*, **2** [10] 226 (1923).

(5) A. S. Watts, "Some Data on Deformation Points of Feldspar-Quartz, Feldspar-Mica, and Feldspar-Beryl Mixtures," *Trans. Amer. Ceram. Soc.*, **14**, 87–94 (1912).

FLINT CLAYS AND FLINT-CLAY REFRACTORIES OF SOUTHERN CALIFORNIA*

By B. M. Burchfiel and Henry Mulryan

Abstract

The occurrence and geology of the flint clays of Orange County, California, are described. As far as is known, these deposits are unique in the Far West. Technical data both on the clays and refractories produced from them are given and discussed, and various uses are mentioned.

I. Introduction

(1) Location

The only deposit of flint clay in California being worked occurs in Santa Ana Canyon, Orange County, California, in the range of mountains forming the south side of the Canyon. It is located forty-four miles southeast of Los Angeles, eight miles west of Corona, and three miles due west of Prado Dam, a flood-control project of Orange County.†

The property, comprising approximately 1800 acres and now known as the Claymont deposit, many years ago was called the Goat Ranch deposit.

(2) History

The Trojan clay has been mined by underground methods for several years, but the Sierra gray flint clay has been mined by surface methods only since 1937.

(3) Topography

The area covered by the Claymont deposit is rugged, the steep, sloping mountains being sharply and deeply dissected by erosional canyons. The mountains rise quickly from the Santa Ana Canyon at 465 feet to an elevation of 3000 feet in about three miles. The deposit of flint clay in the southern part of the property lies at an elevation of 2200 feet, a rise of 1735 feet in two and one-half miles. A long spur that separates Bed Rock Canyon on the east and Gypsum Canyon on the west was utilized as a location for a haulage road to reach the Sierra flint-clay bed, a distance of 3.6 miles. The hills are covered with dense growths of brush and small cypress trees; only the thick sandstone beds are free from the thick brush.

II. Geology

The rocks exposed in this area are chiefly sedimentary and of Cretaceous and Eocene age. The Chico formation of the Cretaceous consists of a thick series of shales, coarse sandstones, and conglomerates. A distinct unconformity occurs between this series and the overlying beds. This unconformity and the lithologic changes have led to the belief that the upper beds are younger in age, probably belonging to the Martinez formation of the Eocene as suggested by Engel[1] and by Sutherland.[2]

Older altered igneous and sedimentary rocks are found along the eastern border of the property. Fossils are uncommon, except for carbonized remains of plants and a single bed, four feet thick, of fossil oysters in excellent state of preservation.

(1) Structural Features

The general structure of the sedimentary beds is a gently dipping syncline with a distinct plunge to the northwest. Minor folding and faulting within the main structure have disturbed the clay beds slightly, and some of the faults of small displacement have a direct bearing on mining costs and methods. Bed Rock and Gypsum canyons follow the courses of two parallel major faults which bound the clay deposits on the east and west sides.

(2) Clay Series

The flint-clay beds, which belong to the Eocene series, are confined to the sedimentary beds above the unconformity, and they are interstratified with plastic clay, shales, sandstones, and conglomerates.

The most important clays are the Trojan, 6 to 14 feet thick, outcropping on the east limb of the syncline; and the Sierra, 5 to 16 feet thick, outcropping on the west limit of the syncline.

(3) Trojan Clay

The Trojan flint clay outcrops on the south side of Bed Rock Canyon. It is gray in color, hard, smooth, and it has a conchoidal fracture; underground, the color changes rapidly to dark gray and black. The clay exhibits little plasticity. Hanging walls and footwalls are stratified sandstones. Spotty areas of gritty clay that are grains of quartz and sand occur occasionally in the smooth clay. Lenses of the overlying sandstone are found as pockets in the flint clay. The apparent thinning of the flint-clay beds is due to these sandstone lenses and is only local in character.

Zones of clay containing several per cent of iron oxide as red hematite stain are found occasionally, and this clay, as well as the gritty clays, is hand-sorted and hauled to the waste dump.

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* Presented at the Golden Gate Meeting, American Ceramic Society, San Francisco, Calif., August 11, 1939. Received August 15, 1939.

† The exact location is the northern portion of Rancho Lomas de Santiago, including portions of Sections 35 and 36, T. 3 S. and Sections 1, 2, 3, 11, and 12, T. 4 S., all in R. 8 W.

[1] Rene Engel, private report.

[2] J. C. Sutherland, "Geological Investigation of Clays of Riverside and Orange Counties, Calif.," *Calif. Jour. of Mines and Geol.*, XXXI of State Mineralogist, pp. 51–86, January, 1935.

Underneath the stratum of Trojan clay throughout a wide area, there are from 2 to 4 feet of so-called gray flint clay. This is a hard flint with approximately 75% of silica and 23% of alumina; it has a P.C.E. of cone 31, and its shrinkage is so low that it has been used successfully as a grog in various refractory products. It appears to be a flint clay of exceptional purity in fluxes, mixed with a high percentage of pure silica sand in its process of formation.

The dip of this entire clay body is seldom more than 10 degrees to the north. An overburden cover of not less than 165 feet thick makes underground mining imperative.

(4) Sierra Flint Clays

The Sierra flint clay consists of a stratum divided in three parts. The uppermost part is light gray, smooth, hard, and nonplastic; the middle section, which is light buff, otherwise is similar to the gray; the third section, which is brown-to-red in color and rough, has little value; and the hanging walls and footwalls are coarse sandstones.

The gray flint, varying in thickness from 1 to 8 feet, is the most important clay, owing to its remarkable uniformity, purity, and its high refractory qualities. The buff flint clay is similar except for a slightly lower fusion point. Its thickness varies with that of the gray flint, averaging from 4 to 6 feet, and it is usually thicker where the gray clay is thinnest.

Both clays have conchoidal fracture and weather easily from large, hard, blocky lumps to particles generally not larger than one to two inches. Each of these smaller particles, however, exhibits a distinct, sharp, conchoidal fracture, and weathering does not progress to the extent that careful grain sizing is impossible; the particles furthermore do not become soft or plastic. Where the underlying impure, colored clay occurs, it varies up to 2 feet in thickness.

III. Mining Methods

(1) Trojan Flint Clay

The thick overburden makes it necessary to recover these clays by underground methods, and the flat dip makes mining methods simple and comparatively cheap. Modified room and pillar stoping is used. The main haulage tunnel and branches, 1000 feet long, are driven southerly into the hillside in the footwall sandstones. Raises near each end of the main branch serve as storage and loading bins for two parallel slopes that are used as tramways for the various drifts and crosscuts in the clay bed. A systematic series of crosscuts and drifts develop and block out the clay, and natural ventilation is effected by their interconnections.

The clay is now removed only from the development work, and the pillars and main blocks will be removed at a later time. Augers and jack-hammer air drills are used for drilling, and dynamite, fuse, and caps, for blasting.

The loaded cars are hand-trammed to the haulage slopes (10 degrees) where they are trammed by gravity into the storage-bin raises. A mule-driven train hauls the clay to the surface pocket, and the clay slides down a 500-foot iron chute into a truck loading bin. Dump trucks haul the clay to storage piles for weathering or to the loading ramp for rail shipment to Los Angeles.

(2) Sierra Flint Clay

The area now being worked permits surface methods. Where the overburden is not more than 25 feet thick, it is removed by caterpillar bulldozer, scorifier, and carryall; no powder is used. The clay is auger-drilled with light hammers and a portable compressor. It is shot lightly to produce lumps for hand loading and sorting. The clay is loaded into mine cars and gravity-trammed down the 17-degree dip into a loading chute. When the first work was done in 1938, the caterpillar carryall hauled the clay one mile to a winze connecting with the main mine tunnel. Dump trucks are now used for the same purpose.

When the overburden becomes too thick, the Sierra flint clay will be recovered by underground mining methods similar to those used on the Trojan clay.

IV. Chemical Analyses

A typical chemical analysis of the Trojan flint clay on the fired basis is silica 57.62, alumina 35.59, ferric oxide 4.37, titanium oxide 1.20, lime 0.31, magnesia 0.62, and alkalis 0.59%: a total of 100.30%.

The chemical analysis of Sierra flint clay, similar to that of representative Missouri flint clays, is silica 51.72, alumina 43.77, ferric oxide 1.73, titanium oxide 1.00, lime 0.12, magnesia 0.40, and alkalis 0.79%: a total of 99.53%. The ignition loss on both clays is 12 to 14%.

V. Shrinkage

In dry-pressed form, fired to cone 13 down, the Trojan flint clay shrinks one-half inch per foot and the Sierra shrinks one inch per foot.

(1) Pyrometric Cone Equivalent

The P.C.E. of Trojan clay is cones 29 to 30 and that of Sierra flint, cone 34 +.

VI. Utilization

When brick are made from Trojan clay only, a total loss from press to yard as low as 2% is not unusual. The brick are quite dense, with a porosity of about 12%, and they have excellent resistance to spalling. They may be used in locomotives and in various places where high refractory qualities are not necessary and where sudden temperature changes and moderate-to-severe slagging action are encountered.

When these brick first appeared on the market, their iron content was a subject of controversy. The siliceous fire clays, common in the vicinity, are low in iron, and the brick generally are light in color. The Trojan clay brick are much darker, and their use was accepted by the trade rather cautiously. The iron content, however, in a clay in which free silica is almost totally lacking, seems to be so combined that its bonding effect apparently is an asset. Service records have removed all

doubt on this point. Brick, with a high proportion of this clay, have the chemical analysis of low-heat duty brick, but they perform like superduty-flint brick up to and including high-heat duty service.

When the Trojan and Sierra flints are used together in a dry-press mix in any proportion desired, brick of excellent physical qualities result. Four such brands, which are regularly manufactured, have P.C.E. values of cones 29 to 30, 32, 33, and 34 +. As the proportion of the hard Sierra flint is increased, manufacturing difficulties increase; e.g., the cone 32 brick offer no particular difficulties, the cone 33 brick bear close watching, and the brick containing the highest percentage of Sierra give all the difficulties to be expected from these hard high-shrinkage flint clays.

The porosities of these four brands do not follow a straight line. The high iron content of the 100% Trojan clay brick decreases the porosity to its value of 12%. The second and third members of the series each have porosities of about 14 to 16%, and the last member, very high in hard flint, has the low porosity value of 12 to 14%.

The weights of these brick increase directly with the increase of Sierra flint and are approximately 7.8, 8.0, 8.2, and 8.5 pounds, respectively.

The last member of this series is one of the densest fire-clay brick on the market and is extremely resistant to spalling. Recent routine Navy Simulative Service Tests in this laboratory showed a spalling loss of 0.17% after the panel had been subjected to the two 24-hour reheats at 3000° and at 2900°F., respectively.

Grog of superior quality becomes completely vitrified by calcining the Sierra flint to cones 13 to 14. A single drop of ink placed on a piece of calcined Sierra flint more than one inch thick will find its way through the fine cracks developed and will appear in these cracks on the opposite side. This clay does not shatter too fine in calcination, and it may be accurately grain-sized. The extremely hard particles retain their sharp edges and corners perfectly through the grinding operation.

The buff flint clay underlying the Sierra flint has not yet been used commercially. It has a P.C.E. of cone 30, fires dark brown in color, and its physical characteristics are nearly identical to those of the Sierra flint. In spite of its iron content of about 10%, a limited use for it may be developed. It would be an extremely cheap clay to produce because, as the Sierra flint is mined, this buff clay is cleanly stripped, developed, and ready for mining in a quantity approximately equal to that of the Sierra flint.

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USE OF NORTH CAROLINA KAOLIN IN CASTING BODIES*

By W. H. Earhart

Abstract

Single changes in ball clays or kaolins were found to cause perceptible changes in the deflocculating and casting properties of bodies. When American ball clays and kaolins, however, were used in proper combination in sanitary ware or electrical porcelain bodies, they were as effective as foreign clays. North Carolina kaolins were found to be similar to the English china clays in deflocculating and casting properties.

The tests used to define the properties of casting bodies include a determination of the deflocculation curve and of the viscosity and casting rates after an adjustment of the specific gravity and electrolyte content was made. For casting purposes, the electrolyte content was adjusted by the so-called "feel" test.

I. Introduction

The purpose of this investigation was to develop data which would show the influence of various ball clays, china clays, and kaolins on the casting properties of bodies for sanitary ware and electrical porcelain. In these bodies, the use of domestic kaolins requires a consideration of the casting properties, not only of the particular kaolin but also of the ball clays and other kaolins with which it is to be used. The choice and combination of kaolins and ball clays were found to be a major factor in determining the casting qualities of the body.

This investigation includes studies of nine ball clays and nine kaolins to demonstrate their individual effects in casting bodies and to show how their individual characteristics may be considered when compounding a casting body.

The tests, which were used to define the casting properties of the test bodies, were limited to those of immediate interest to the practical plant man and included the determination of viscosity, electrolyte concentration, and relative casting rate of the various bodies after an adjustment was made to the same specific gravity and "feel." The deflocculation curves of all test bodies were also determined to show the action of electrolytes on the various bodies and the dry-strength data were obtained because they have an important

* Presented at the Forty-First Annual Meeting, American Ceramic Society, Chicago, Ill., April 19, 1939 (White Wares Division). Received May 27, 1939.

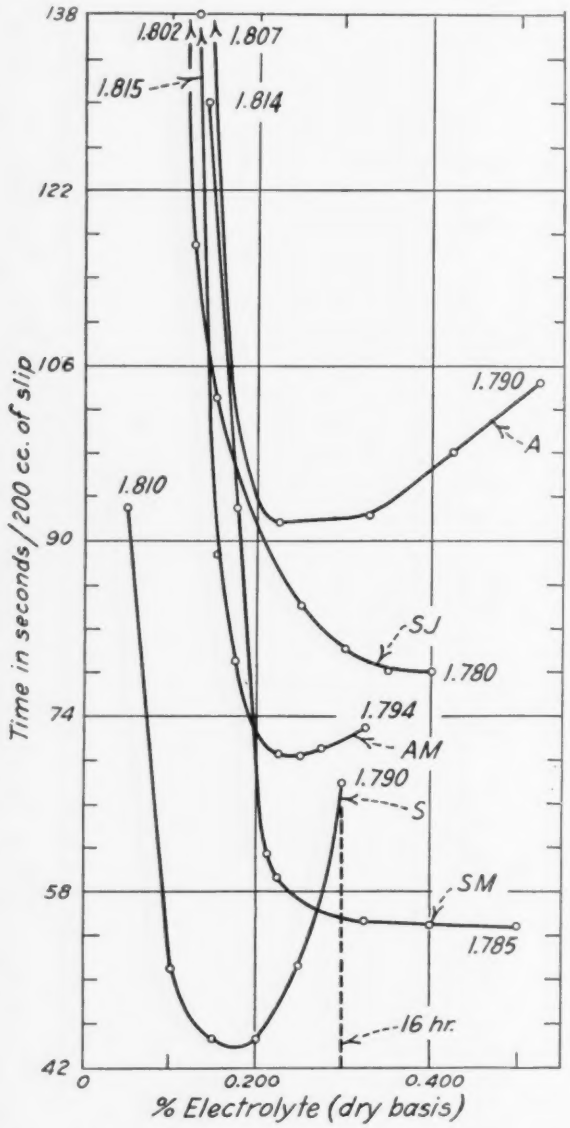

FIG. 1.—Deflocculation curves; orifice = 0.154 inch diameter; water = 17.1 sec. per 200 cc.

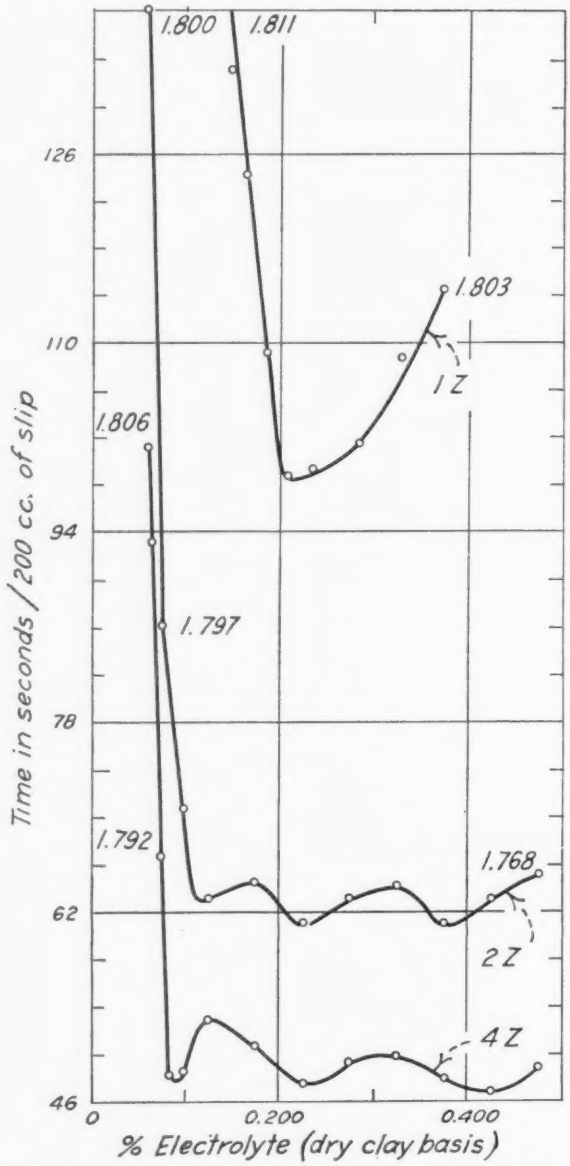

FIG. 2.—Deflocculation curves; orifice = 0.154 inch diameter; water = 17.1 sec. per 200 cc. 1Z = 10% Ky. Old Mine No. 4 and 10% Ky. No. 12; 2Z = 5% Ky. Old Mine No. 4, 5% Ky. No. 12, and 10% Higman's No. 12; 4Z = 18% Higman's No. 12.

bearing on the ease and care with which the dry ware may be handled.

II. Procedure

The method of preparing the test bodies consisted in blunging and screening the clay portion of the body; the nonplastic portion was added and blunging was continued until a homogeneous slip was obtained. Sufficient water was added to insure a slip which was thin enough to blunge well but not so thin as to permit classification of the nonplastic portion. No electrolyte was added during blunging. After the slip was dried to a plastic state in plaster bowls and the body was aged for three or four days to permit equalization of the plasticity water, the water content was determined. A portion of the plastic body was used to determine the deflocculation curve and the remainder to determine the casting properties. The deflocculating agent used in these tests was a solution of 60% of "N" brand silicate of soda and 40% of c.p. sodium carbonate. The percentages of electrolyte added were expressed in terms of the dry body and dry electrolyte and were entered in the data in this form.

The "feel" test was used to adjust the electrolyte content so that all of the casting slips had the same state of deflocculation. Casting slip was poured into a shallow plaster mold and was allowed to stand for five minutes, after which the excess slip was poured off and allowed to drain until all dripping stopped. The thin

skin of cast body was immediately peeled from the mold and was worked between the fingers to judge the plasticity or feel. At the correct feel, the clay has a good plastic consistency, about equal to that of a hotel china body. With insufficient electrolyte, the "feel" is soft or even mushy, and the casting may sag in the mold or crack in drying, owing to its excessive drying shrinkage.

TABLE I

COMPOSITION AND CASTING AND FIRING PROPERTIES OF TEST BODIES

	A	AM	S	SM	1SJ
			Composition (%)		
Flint	20	20	22	22	22
N. H. feldspar	27	27			
Lakefield syenite			28	28	28
Kamec kaolin	20	20	25	25	25
Ball clays					
Champion-Challenger	15	15			
Jernigan	18				10.0
Tenn. Martin No. 5		18		10.0	
Ky. Old Mine No. 4			7.5	7.5	7.5
Ky. No. 12			7.5	7.5	7.5
Tenn. Wade No. 5			10.0		
			Casting properties		
Specific gravity	1.807	1.804	1.802	1.809	1.806
Viscosity (sec./200 cc.)	83	88.5		111.8	157
Rate of cast (gm. dry cup)	280	292	210	390	413
Dry modulus of rupture (lb./in.²)	410	405	806	375	430
Electrolyte (%) by feel	0.160	0.152	0.04	0.154	0.132
Feel test	O. K.	O. K.	O. K.	Slightly soft	O. K.
			Firing properties (cone 10[6])		
Total linear shrinkage (%)	10	11.1		12.3	12.8
Modulus of rupture (lb./in.²)	7500	6340		6000	9700
Ink-test resistance	Bad	Fair		Good	Good

With an excess of electrolyte, the feel is hard, short, and brittle; the casting rate is apt to be slow; and the casting itself may be so brittle that it "feathers" when it is trimmed. The adjustment of the slip to the correct feel balances these two effects. The cast is just firm enough to prevent sagging when the cores are drawn, but it is soft and plastic enough to trim satisfactorily, and the casting rate is the fastest possible under these conditions.

The determination of the dry and fired properties followed the standard test methods of The American Ceramic Society.[1]

The problem was approached from the standpoint of the ball clays. Each kaolin or combination of kaolins seemed to place certain demands on the types and properties of the ball clays with which it was used in a casting body. Casting bodies, which contained North Carolina kaolin and American ball clays, required about 28% of Lakefield nepheline syenite or 33 to 35% of potash feldspar to give the desired vitrification at cone 10. The problem, therefore, was to determine which of the ball clays, alone or in combination, would give the best results with North Carolina kaolin.

III. Influence of Ball Clays

Table I shows a series of bodies in which the compositions of Jernigan, Tennessee Martin No. 5, and Tennessee Wade No. 5 ball clays are compared. Their casting and firing properties are also given. Figure 1 gives the deflocculation curves of these test bodies. These data show that Tennessee Wade No. 5 is more reactive toward electrolyte and a more fluid ball clay than either the Jernigan or the Tennessee Martin No. 5 clays. The Jernigan and Martin No. 5 clays are similar in casting and deflocculation properties.

Table II shows the composition of a series of test bodies which were used to study the effect of changes in

[1] Standards Report, *Jour. Amer. Ceram. Soc.*, **11** [6] 448–57 (1928).

TABLE II

COMPOSITION AND CASTING PROPERTIES OF TEST BODIES

	1Z	2Z	3Z	4Z	5Z	6Z	7Z	8Z	9Z
					Composition (%)				
Flint	22	22	22	22	22	22	22	22	22
N. H. feldspar	10	10	10	10	10	10	10	10	10
Lakefield syenite	18	18	18	18	18	18	18	18	18
Ga. No-Karb kaolin	10	10	10	10	10	10	10	10	10
N. C. Kamec kaolin	20	20	20	22	22	22	22	20	22
Ball clays									
Ky. Old Mine No. 4	10	5	5					5	
Ky. No. 12	10	5	5					5	
Higman's No. 12 English		10		18		9			9
Higman's No. 10 English			10		18	9			
EPK Fla. kaolin							18	10	9
					Casting properties				
Specific gravity	1.805	1.805	1.814	1.806	1.765	1.800		1.800	1.800
Viscosity (sec./200 cc.)	118	139	112	93	54	129	Thick	297	201
Rate of cast (gm. dry cup)	377	436	360	366		470		535	525
Dry modulus of rupture (lb./in.²)	265	284	310	307	215	200	210	293	275
Electrolyte by feel (%)	0.164	0.06	0.07	0.065	0.350	0.08	0.50	0.15	0.165
Feel test	O. K.	O. K.	Hard	O. K.	Very soft	Slightly hard	Soft	O. K.	O. K.

combinations and kinds of ball clays. As representative of two widely different types of English ball clays used in casting bodies, Higman's No. 10 and No. 12 were chosen. With less than 20% of American ball clays, the bodies became too nonplastic, but 18% of English ball clays was permissible owing to their greater plasticity.

Table II also shows the variations in casting properties obtained by changing ball clays in a body otherwise the same in composition. Figure 3 shows the deflocculation curves of the bodies containing only English ball clays, whereas Fig. 2 compares Higman's No. 12 ball clay with a 50–50 combination of Kentucky Old Mine No. 4 and Kentucky No. 12. Higman's No. 12 is shown to be a strongly reactive ball clay with such a marked action in the body that it even masks the action of the Kentucky ball clays used. A consideration of these data seems to indicate that when two ball clays are used in a body, the body is given some of the deflocculation and casting qualities which are obtained with each ball clay separately. This is shown by bodies 4Z, 5Z, and 6Z; 7Z, 8Z, and 9Z; and also by other combinations.

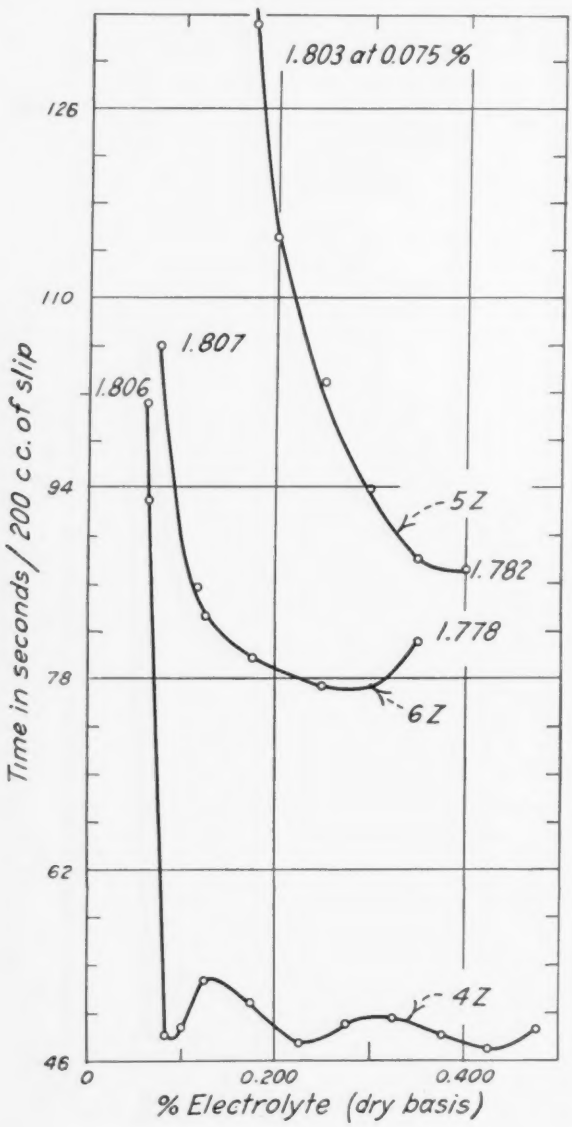

FIG. 3.—Deflocculation curves; orifice = 0.154 inch diameter; water = 17.1 sec. per 200 cc. 4Z = 18% Higman's No. 12; 5Z = 18% Higman's No. 10; 6Z = 50–50 Higman's No. 12 and No. 10.

The results of these data show that the ball clays investigated may be divided into three groups as follows: (1) a low-viscosity, low-electrolyte, or highly reactive group, represented by such ball clays as Tennessee Wade No. 5, Higman's No. 12 English, and possibly Champion-Challenger ball clays; (2) an intermediate viscosity group with a medium sensitivity toward electrolyte, represented by Jernigan and Tennessee Martin No. 5 and possibly by the 50–50 comtion of Kentucky No. 12 and Old Mine No. 4; and (3) clays with a low sensitivity toward electrolyte, which impart high viscosities to bodies in which they are used, viz., Higman's No. 10 English ball clay and EPK Florida kaolin.

Members of this last group may possibly be used to advantage in bodies to improve their trimming qualities and casting rates or to increase the viscosity.

IV. Influence of Kaolins and China Clays

Body SJ, which had a fast casting rate, high dry strength, and a deflocculation curve with a gradual slope, was chosen for this test.

The casting and firing properties of this series of tests are given in Table III; Fig. 4 shows the deflocculation characteristics of the standard body incorporating American kaolins, and Fig. 5, the results with English china clays. These data show that the influence of kaolins or china clays on the casting and deflocculation properties is as variable as that of the different ball clays. Some of the bodies were overdeflocculated at 0.05% electrolyte, which prevents any conclusions as to their relative viscosities and casting rates.

The deflocculation curves and casting data indicate that the kaolins and china clays may be divided into three general groups (on the same basis as used for the ball clays). Group (1) contains the low-viscosity china clays and kaolins, abruptly reactive to small concentrations of electrolyte, such as the "No-Karb" and M. & M. No. 27 Georgia kaolins; (2) is represented by such medium-viscosity clays as Kamec and Harris Lunday N. C. kaolins, and VC-1, M. & M. No. 17, and the No. 30 English china clays; the latter seem to be somewhat more abruptly sensitive toward electrolyte than the N. C. kaolins; and (3) contains the high-viscosity clays, represented by Georgia Pioneer kaolin and M. & M. No. 44 English china clay; EPK Florida kaolin may also be included in this group.

TABLE III

CASTING AND FIRING PROPERTIES*

Casting properties	1SJ	2SJ	3SJ	4SJ	5SJ	6SJ	7SJ	8SJ	9SJ
Specific gravity	1.806	1.803	1.801	1.800	1.804	1.803	1.801	1.800	1.800
Viscosity (sec./200 cc.)	157	78	137	248	45	114	105	128	103
Rate of cast (gm. dry cup)	412	360	451	374	333	434	355	415	425
Dry modulus of rupture (lb./in.^{2})	430	357	415	575	460	420	395	315	290
Electrolyte by feel (%)	0.132	0.05	0.05	0.075	0.05	0.07	0.05	0.05	0.05
Feel test	O. K.	Very hard	Hard	Hard	Very hard	Very hard	Very hard	Hard	Hard
Firing Properties (cone 11[6])									
Total measured shrinkage (%)	12.8	11.5	12.4	13.7		11.9	11.5	11.5	11.5
Modulus of rupture (lb./in.^{2})	9800	10500	9000	10000		9800	8000	7700	8500

* All passed ink test satisfactorily.

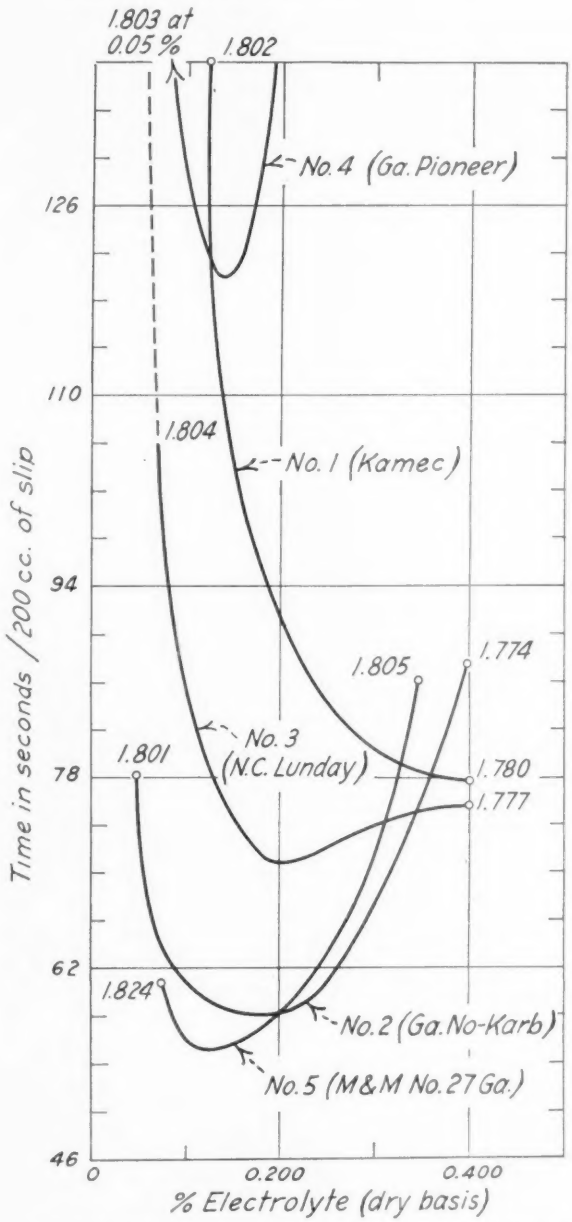

FIG. 4.—Deflocculation curves; orifice = 0.154 inch diameter; water = 17.1 sec. per 200 cc. American kaolins, SJ test body: 25% kaolin, 22% flint, and 28% syenite; ball clays: 10.0% Jernigan, 7.5% Ky. No. 12, and 7.5% Ky. Old Mine No. 4.

These data indicate that body 1SJ has good deflocculation and casting qualities, good dry strength, and cone 10 vitrification. Its composition is flint 22%, Lakefield syenite 28%, and N. C. kaolin 25%; and ball clays, viz., Jernigan or Tenn. Martin No. 5 10.0%, Ky. Old Mine No. 4 7.5%, and Ky. No. 12 7.5%.

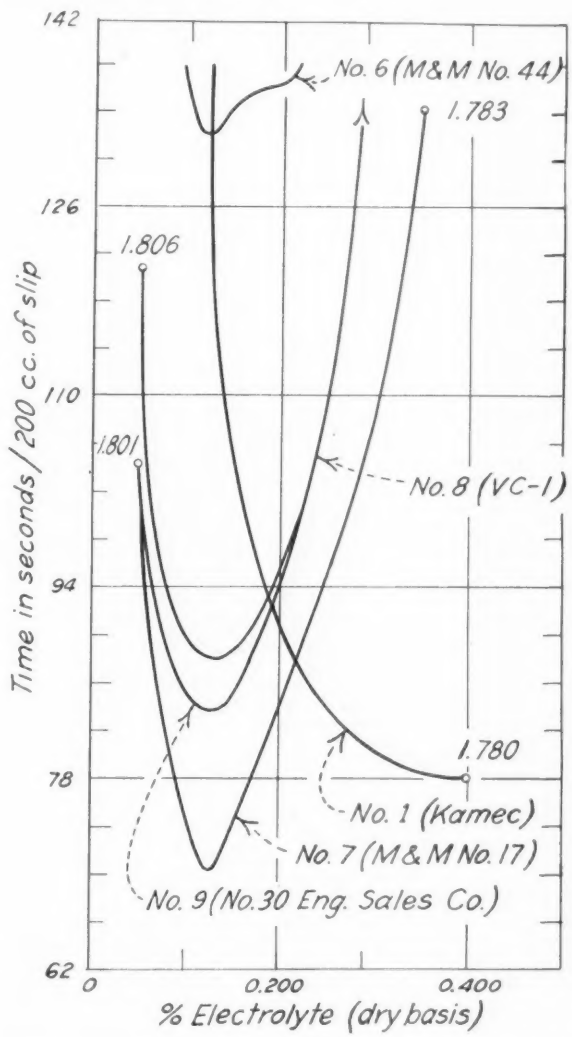

FIG. 5.—Deflocculation curves; orifice = 0.154 inch diameter; water = 17.1 sec. per 200 cc. English china clays, SJ test body: 25% china clay, 22% flint, and 28% syenite; ball clays: 10.0% Jernigan, 7.5% Ky. No. 12, and 7.5% Ky. Old Mine No. 4.

V. Conclusions

(1) American kaolins and ball clays may be used satisfactorily in casting bodies for sanitary ware or electrical porcelain, but the casting properties are influenced by the combinations of kaolins and ball clays used.

(2) The data indicated that ball clays, china clays, and kaolins may be classified into three general groups, based on the magnitude of the viscosity of the "standard" test body in which they were individually substituted. These three classifications were group (1), the clays which imparted low viscosity to the body; group (2), intermediate viscosity; and group (3), high viscosity.

(3) By determining the casting qualities of the individual clays, a test body of almost any casting properties may be compounded. The following generalizations may serve as illustrations: (*a*) A body of high specific gravity and low viscosity may be developed by the use of the low-viscosity kaolins and ball clays of group (1); (*b*) the group (2) or intermediate-viscosity clays may be used in a body of intermediate specific gravity and viscosity; (*c*) the group (2) and high-viscosity group (3) clays should be used to develop a low-specific gravity body with intermediate viscosity in order to offset possible classification tendencies and give fast casting rates; and (*d*) if one clay, e.g., a group (2) kaolin, is to be replaced by a kaolin of the type found in group (1), the viscosity and casting rate probably will be reduced, and the viscosity and casting rate may be increased by using a higher viscosity ball clay, e.g., from group (3).

In the laboratory development of a casting body, this method should help reduce the uncertainty when a haphazard selection of clays is used, and it should facilitate obtaining a body of the desired properties with a minimum number of trials. This approach to casting problems is little more than a suggestion until more data are obtainable with which to work and more tests have been made to test their value.

Acknowledgments

The author wishes to acknowledge the advice and supervision of the work by G. A. Bole and the cooperation of the companies that supplied the raw materials used in these tests, namely, the H. C. Spinks Clay Co., Kentucky-Tennessee Clay Co., Georgia Kaolin Co., Edgar Brothers Co., Harris Clay Co., John W. Higman Co., English China Clay Sales Corp., Kaolin, Inc., American Nepheline Corp., Golding-Keene Feldspar Co., and the Central Silica Co.

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INFLUENCE OF INTERNAL LUBRICATION ON DRYING AND FIRED CHARACTERISTICS OF A PLASTIC CLAY BODY*

By H. R. Straight

Abstract

A treatment applied to clay in the plasticizing processes is described, which reduces internal friction in a die or form-molded ceramic shape. The methods of application and the determination of the correct proportion of treatment are outlined.

I. Introduction

The basic idea of this study is that minerals which are polar have a high attraction for soaps, and by adsorptive forces between the minerals and soaps monomolecular films are formed over the interfaces of the minerals. These films, however, lie over a thin film of water between the soap film and the mineral interfaces. The adsorptive attraction between the soaps, mineral grains, and colloids tends to squeeze the water film to a minimum thickness with the resulting elimination of some of the water of plasticity. A lubrication effect between the mineral grains and colloids is attained.

(1) Research Plan

To determine the physical effects on ceramic bodies, a research project was organized among twelve clay manufacturers in Iowa and surrounding states. This paper is a progress report on the results of tests made in the plant of the Adel Clay Products Company, and some ideas are proposed which have not yet been given a commercial test.

* Presented at the Forty-First Annual Meeting, American Ceramic Society, Chicago, Ill., April 18, 1939 (Structural Clay Products Division). Received April 18, 1939.

II. Test Procedure

The increase in fired strength of clayware was found to be almost directly proportional to a marked decrease in drier shrinkage, but this checks only with clays that show vitrification. Because the lubrication of the monomolecular soap films on the mineral particle surfaces might cause reduction in drier shrinkage, lubrication between the particles was increased by the use of a liquid hydrocarbon lubricant. Kerosene was finally adopted for this purpose for commercial use in this plant.

III. Advantages of Method

(1) Less Pugging Water

With 1 pound of fatty acid to 10 tons of clay and 1 pound of kerosene to $1^1/_4$ tons of clay, the drier shrinkage was decreased 50%, extrusion power was reduced

approximately 12%, drying was more rapid, and the necessary plasticity was secured with much less pugging water. Approximately 1 pound of kerosene replaces 80 pounds of water.

(2) Less Drying Heat

The use of the oil decreased surface tension and increased vapor pressure. The water flows through the body and to the surface more freely, and a more thorough vaporization takes place with less heat. The humidity of the drying air at any temperature is raised, which, in turn, increases the efficiency of the drying process.

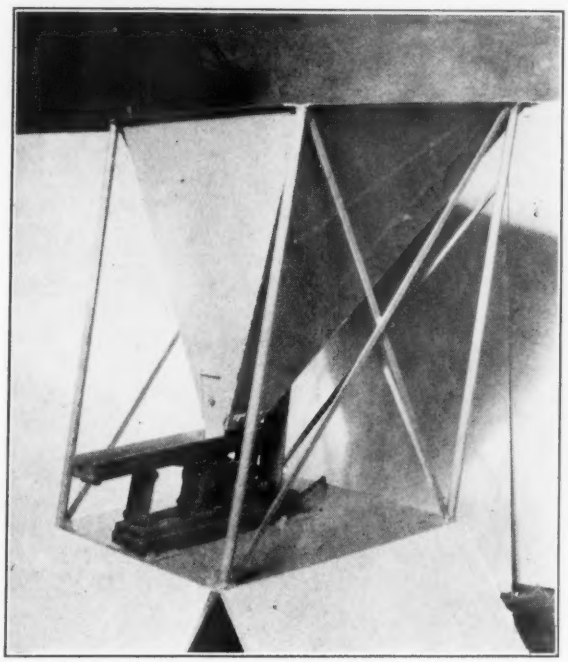

FIG. 1.—Vibrating electric feeder used to add soda ash to alkalize the water.

(3) Dunting Eliminated

Dunting or air-checking, by this process, has been entirely eliminated.

IV. Application of Flotation Principles

This idea follows the basic principles of the flotation process in ore dressing, and some of the developments of concentration of ores may be used. Richards[1] gives the following summary of this process: (1) the addition of oil lowers the surface tension and thereby promotes wetting; (2) adhesion of the oil to the mineral surfaces tends to cause water to be displaced; (3) saponification of the oil provides a means of imparting oil as needed in a minutely subdivided state for oiling the minute mineral particles; (4) a contaminant, such as oil or solubles in water, concentrates at the surface and by so doing affords a means of adjusting the strength of the film to shock and pressure; (5) the oil-water interface is more viscous than the body of either liquid; (6) oil is attracted and absorbed by mineral particles which pull on the films containing oil; and (7) film strength of an oil-water mixture prevents coalescence of the soluble minerals.

[1] T. D. Richards, Principles of Flotation.

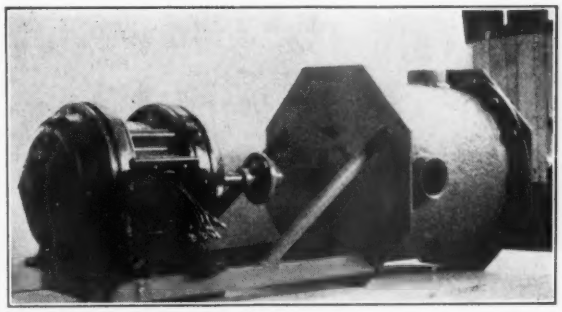

FIG. 2.—The saponifier chamber contains a 6-in. motor-boat propeller which drives the pug water through a conical screen in the chamber as the oil-acid mixture is added into the chamber and as the pug water passes through the chamber.

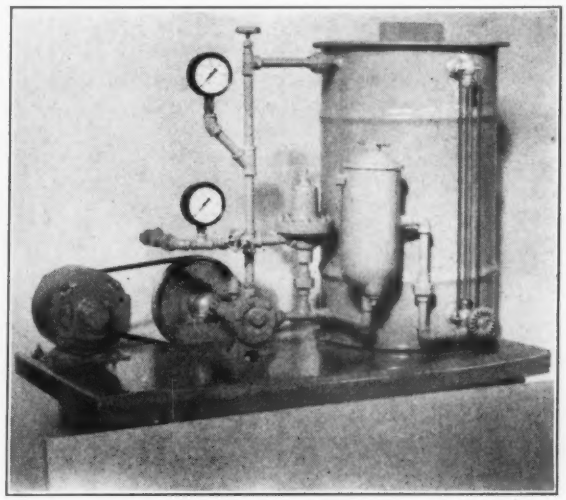

FIG. 3.—The proportioner used to feed a variable amount of acid-oil mixture under pressure into the saponifier.

V. Use of Pine Oil

A liquid hydrocarbon, such as a lubricating oil, mixed with a fatty acid under alkaline conditions, results in a film that is somewhat brittle. This film may be improved by the use of pine oil, which is completely miscible with kerosene or any other light hydrocarbon and results in a tougher film.

VI. Summary

(1) The reduction of surface tension in a water-oil-soap mixture reacts in plasticizing clay to cause a reduction of the absorptive force on tightly held adsorbed gases, thus reducing blisters by cutting loose the gases by superior attraction of the liquids.

(2) The reduction of surface tension in such a mixture accelerates the wetting of the minerals and the plasticizing of the dry clay.

(3) The internal lubrication of the composite mass and the external lubrication of minerals comprising the ceramic mass reduce the power and wear of parts required to plasticize the mass and the power to mold it into units.

(4) The internal lubrication of a mass of minerals permits the particles to glide into more intimate relationship with a reduction of pore space and of water of plasticity. The addition of pine oil is expected to toughen the lubricating film so that it will resist movement on the mineral surfaces under pressure and between adjacent surfaces of minerals.

(5) The lubrication effect of the water-oil-soap combination gives the clay a waxy nature and improves its molding qualities.

(6) The reduction of pore space and water of plasticity reduces drier shrinkage to a marked degree.

(7) The reduction of surface tension within a drying unit, which increases the effective vapor pressure at any temperature as well as the capillary flow, accelerates the drying rate and reduces drier strains because no part of the body of the units so treated dries until an approximate leather-hard state is approached throughout the body of the unit regardless of air currents around the unit.

(8) The reduction of water of plasticity through the more highly effective action of a small amount of oil-soap mixture present in plasticizing a ceramic body increases drier capacity.

(9) The improved capillarity within a ceramic body which is being dried increases the humidity of the air in a drier. The capacity of the radiation units in radiated heat driers is increased by increasing the flow of heat from the radiating surfaces and into the drying material.

(10) The conversion of the solubles of the water and soluble mineral constituents of a ceramic body into comparatively insoluble soap prevents their free migration to the surface of a drying unit.

(11) The absorptive force exerted by the minerals on the oil-soap combination maintains intimate contacts of solubles and silicates and thereby promotes vitrification and body maturity in firing.

(12) The increase of film toughness through the mixture of oils and solubles with the addition of pine oil should increase the dry strength.

(13) The prevention of solubles migrating to the surface in drying causes uniform fluxing during firing with accompanying uniform firing shrinkage and elimination of strains in cooling because of uniform body characteristics.

(14) The more efficient use of the solubles through uniform distribution lowers the fluxing temperature approximately 40°F. and accelerates fluxing as much as 30%.

(15) Bonding of the silicates by the uniform distribution of solubles increases the fired strength in crushing and transverse as much as 100% and reduces water absorption of a fired body as much as 40%.

(16) The reaction of oleic acid on sulfates results in the formation of free sulfuric acid, which reacts instantly and completely with barium carbonate when used, and increases the efficiency of any barium used to whatever extent sulfuric acid is thrown out of the sulfates by the oleic acid.

(17) The dielectric strength of a ceramic body must bear some direct relation to transverse strength and must be greatly affected by this oil-soap admixture.

(18) The over-all savings in cost of manufacture per ton, which has been in use for more than a year, are approximately 25 cents per ton of ware above the cost of the treatment.

STRAIGHT ENGINEERING COMPANY
ADEL, IOWA

USE OF REFRACTORIES IN MELTING COPPER AND COPPER ALLOYS IN AN AJAX-WYATT INDUCTION FURNACE*

By Seaver H. Booth

Abstract

A description is given of the construction and operation of the Ajax-Wyatt induction furnace used to melt copper and copper alloys. The refractory parts are described as well as the problems which occur through refractory failures. Recommendations are made, and the composition is given for an American alumina cement that has been found to give satisfactory service.

I. Introduction

The Ajax-Wyatt induction furnace, probably the most widely employed means of melting copper alloys for use in rolling mills, represents one of the greatest advances in alloy melting since the introduction of the graphite crucible. This furnace was developed to its present form in 1916 by G. H. Clamer and J. R. Wyatt of the Ajax Metal Company. One hundred and thirty-eight of these furnaces are in use by the American Brass Company, producing 92% of that metal poured in 1938.

The furnace is easy to construct and to maintain. It might be described as a transformer, the secondary circuit of which is a vertical loop of molten metal contained within a block of refractory material and connected with the body or crucible of the furnace above. The resistance to the currents induced in this loop of molten metal creates the heat necessary for melting. Because the heat is generated within the metal, the furnace has high thermal efficiency. Another useful effect that takes place in this passageway is the constant flow back and forth of the molten metal due to a pinch force which causes the liquid metal to pulsate in and out of the secondary circuit, creating a desirable stirring action.

II. The Refractory Parts

The duct which contains the loop of molten metal forming the secondary circuit is termed the slot; the refractory part of the furnace containing the slot is the slot block; and the body of the furnace containing the main part of the charge is the crucible.

The slot block has a horizontal, centrally located hole about 11 inches in diameter to accommodate the primary coil, and it is cooled by forced air. The high temperatures in the melt and the constant flow back and forth of the liquid metal in the slot subject the refractory to a severe erosive action.

The cross section of the slot varies in different plants from a rectangular shape, about $^3/_4$ by 3 inches, to a circle of about the same area, and the shape varies from a V to an oval, circle, or U to suit the requirements of the users.

In general, the method of putting a block together is much the same whether it is built directly into the furnace or is preformed. A finely divided refractory material containing a suitable amount of moisture is rammed in layers with an air hammer, the surface of each layer being thoroughly scratched and scored with a sharp tool before adding another layer to produce the proper bond. The slot is formed by introducing at the proper time a suitable form or pattern around which the refractory is rammed. This form is later removed by various means according to its construction.

After the slot block is in place in the furnace, the crucible is lined with a heat-insulating material, and the refractory lining is rammed in around a form designed to give the desired inside size and shape.

These operations are not complicated, but they require the greatest care. The installation and operation, however, are sufficiently simple to make unnecessary the employment of operators of the old familiar type of pot fire casters who spent years learning their trade.

III. Operation of Furnace

The usual method of starting a furnace is to preheat the lining with a kerosene torch, and when it is hot enough, to dump in sufficient molten metal to fill and cover the slot to the depth of about two inches. The charge is then built up by the addition of the necessary metals. If the furnace is not required for service immediately, it is often the practice to let it stand for a number of hours on a low voltage to give the lining a chance to heat up slowly.

To prevent excessive oxidation of the metal, it is customary to cover most alloys during the melting period with a good layer of charcoal, which is skimmed off before it is poured together with any dirt or oxides which have collected. In melting brass alloys, the inside surface of the crucible will gradually build up with a deposit of oxides to such an extent that the inside diameter of the crucible will be reduced materially, interfering with the capacity of the furnace. This is removed from time to time (usually about once a week) with an air hammer and long chisel. Sufficient molten metal must be kept in the furnace to cover the slot and to maintain the secondary circuit.

IV. Refractory Failures

A furnace seldom goes out of commission because of a failure of the lining in the crucible. The principal problem rests in the slot block. Failure here may be caused by a sudden blocking up of the slot, which may occur if the furnace has been poured too low or if slag builds up rapidly. This causes the circulation of metal to

* Presented at the Autumn Meeting, Refractories Division, American Ceramic Society, Conneaut Lake, Pa., September 8, 1939. Received September 26, 1939.

stop and the furnace to cease functioning. What is more often the case, however, is a gradual building up of the slot which so reduces the cross section as to slow down the furnace to a point where its operation is unprofitable.

A failure, which is a refractory problem, is one in which the slot block leaks in such volume that the leak cannot be stopped or the molten metal leaking out shorts the primary coil and damages it so that it will no longer function, in which case the furnace must be dumped and rebuilt.

A leak may occur (1) from a break in the refractory caused by improper ramming, (2) from a refractory that will not ram closely enough, or (3) from the wearing away of the refractory by the circulation of the metal in the slot, which is more rapid if the refractory is unsuited to the alloy in the furnace.

The permeability of the refractory is also an important factor. Zinc vapor will sometimes pass through the block to the hole around the primary coil and there condense, drop on the coil, and short it. This has been particularly troublesome with some refractories. Frequently, when copper or alloys of nearly 100% copper are melted, the copper oxide will penetrate the block slowly and will gradually build up under the coil.

The useful field of the Ajax-Wyatt furnace has widened gradually as refractories have been found which are suitable for the requirements of the various alloys.

Fifteen years ago, when ground fire brick or materials of a similar composition were used for linings, about 80% of copper was considered to be the top limit in the copper content of the alloys that could be handled. This figure was raised, however, and nickel silver and cupro-nickel were added to the alloys which could be melted commercially, when lining materials incorporating chromite, and later magnesia, were brought into use.

When attempts were made to melt pure copper and alloys of 98% or more, it was realized that resistance to high temperature was not the only requirement for refractory materials needed for some applications. It was found, for instance, that a material that could handle 30% cupro-nickel and poured at a temperature higher than 1350°C. (2460°F.) could not hold copper or high copper alloys which are poured at about 1200°C. (2190°F.). The introduction of an English cement, theoretically not highly refractory, first made the melting of the high copper alloys possible for this Company. A domestic product, however, was soon found with about 80% Al_2O_3 and 11.5% SiO_2, which will not only handle the work but is useful on many other types of alloys. Although the regular crystalline compound, $3Al_2O_3 \cdot 2SiO_2$ shows promise, the use of MgO for high copper work has been disappointing.

V. Summary of Discussion

English cement seems to be used chiefly in melting pure copper. The American 80% alumina cement yields better results on rich alloys. As high as 11,000 to 12,000 heats of 1000 pounds each have been obtained on yellow brass with American alumina cement, which figures 11 to 12 million pounds for each lining.

On nickel-silver and nickel-copper, fused magnesia cement seems to be giving the best results. The American materials are by far the majority of materials used. On a half-dozen tests of each, prefired blocks have not shown results as satisfactory as the cements mentioned.

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EDITORIAL

THE PRESIDENT'S ADDRESS*

By A. I. Andrews

America is probably the only place in the world where a technical meeting of the size and importance of this Annual Meeting of The American Ceramic Society could be held. We are very fortunate in the present world turmoil that we can gather together to discuss technical problems, to visit socially, and to have a Meeting such as this. We are glad to be holding our meeting in Canada at this time, particularly since the United States and Canada have grown together in perfect harmony and both countries look forward to a better civilization. If we in the Western Hemisphere continue our progress scientifically, technically, socially, and politically as we have in the past, we may be able to aid greatly in the reconstruction of Europe after the present war. We sympathize with the technical men in Europe and in evidence are continuing many of them as members even though they are temporarily unable to pay their annual dues. The American Ceramic Society, although young, is international in scope, cooperating with all other organizations having similar objectives. The American Ceramic Society at this time greets the Canadian Ceramic Society and expresses its appreciation of the cooperation which has been enjoyed and which will unquestionably be continued.

The American Ceramic Society is not an old organization, but it has reached an age where its founders and early members have either passed on or are relinquishing their responsibilities in The Society to younger men. There was a time when technical work was only an older man's occupation, but this has all changed now. The young technical man is now our hope and a guarantee to greater developments.

Men leaving technical schools today are much better trained than those of us who left twenty or even ten years ago. Not only are the engineering data and methods further developed and better organized, but they are also taught better. Even in the fundamentals of physics and chemistry, great changes have taken place. Where we used to learn what happened under certain conditions, the student now also learns an entirely new science which explains why certain things happen and how to anticipate them. Read a modern book on physics and chemistry and then compare it with the one you may have studied in school.

A good teacher of ceramics today does not use obsolete thought in his chemistry and physics without being repeatedly reminded of the fact by some bright student. As a professor in one of America's large universities, I find that it is necessary to read constantly, not just ceramic and engineering literature, but also that of many related sciences. X ray, microscopy, petrography, mineralogy, metallurgy, metallography, spectroscopy, as well as the physics of light, heat, and electricity, and the many branches of chemistry are developing so rapidly that one dares not get behind.

The technical man of today must go forward or else be left hopelessly behind, for the competition from this new thought will constantly become more real. We can never cease to educate ourselves in this rapidly changing world.

The American Ceramic Society, its publications, and its meetings are an aid to keeping up to date, but one must develop his background so that he will be able to read intelligently and to appreciate what is made available through our Society. If you make the statement that the papers are too technical, it is a sure indication that you are falling behind.

It seems to me that there is nothing that the technical industrial man could do better than constantly to bring young blood into his sphere. The experience of developing the younger man in the practical ways of the business and the contact with one who has not been trained in the old school is good for anyone. This younger generation which is coming along is not a jazz-crazy generation; it is a very serious-thinking group, and if you could but make one plant inspection trip with a dozen of these boys, you would be completely convinced that they do mean business. I suggest to you men in the industry that you take advantage of the potential future of this younger generation, contact it, and then keep in contact with it. Do not bury it in a routine job somewhere in your plant. The larger corporations have definite programs along this line, and they are proving very successful.

The men graduating from college today have been sorted over in high schools, and they are then again put through an elimination process in which less than one in three entering an engineering college actually is graduated and offered to the industry. In addition, many of these men actually earn their own way through college. Knowing these men as I do, I feel that there is nothing that will stop them. Some advance faster than others but, given a chance, every one of them will find his place. It is up to you gentlemen to develop these men for the future of the industry.

There is only one thing which can solve the problems of the world today and that is cooperation. It was cooperation that founded The American Ceramic Society, that caused it to grow, and that brought you here today. The American Ceramic Society is our greatest medium of cooperation in ceramics. At our Meetings, we gather together and discuss our mutual, and sometimes individual, problems. This Society is not restricted to ceramic men, but includes geologists, chemists, physicists, metallurgists, and a long list of others interested in borderline and real ceramic problems. This cooperation should be encouraged and expanded to include more of the executives of our industries. As these executives appreciate the service which

* Presented at the Forty-Second Annual Meeting, American Ceramic Society, Toronto, Canada, April 8, 1940 (General Session).

The American Ceramic Society is offering, they will contribute more to its support.

The American Ceramic Society is a strong, healthy organization, both objectively and financially. It is living well within its budget and is actually adding somewhat to its reserve each year. This is not an indication that more funds are not desirable, but that the activities of The Society are being so curtailed as to balance with the income. There are possibilities for the expansion of the activities of The Society, and as The Society grows, more and more of these should be taken on.

The membership of The Society should be increased considerably, since this would lead to the increase of its benefits to individuals and would also add to the available funds. It has been estimated on fairly reliable data that the ceramic industries in the United States employ 260,000 persons, that there are 3000 ceramic plants, and that the schools graduate 150 ceramic engineers each year; and yet our enrollment totals only about 2000 persons. It is the duty of each and every member of The Society to contact those men who should, but do not, belong to The Society so as to give them its many benefits and also to promote the cause for which The Society was organized.

It is not the object of this address to give you a summary of the activities of The Society during the past year as such information is currently published in *The Bulletin*.

The finances of The American Ceramic Society are in good shape and the membership, both Corporation and Personal, has shown a steady rise since the bad days of the depression. Our Secretary and his Staff are doing a good job.

There is one activity upon which The American Ceramic Society should expand extensively, namely, the matter of publicity for ceramics. In this, we start with a handicap in that the word "ceramics" is not self-descriptive, and the general public has either no conception or a misconception of its meaning. Few people, even in the more educated classes, would associate glass, refractories, enamel, or even structural clay products, with the word "ceramics." This is our fault and the fault of the industry in that we do not use the word "ceramics" more in our conversations, in our writing, and in our advertising. With the constant encroachment of imitative articles on our truly ceramic products, it is becoming more and more important that the public be made aware of the true character of "ceramics." The very fact that the word "ceramics" is not well known might give it especial advertising value as it would attract attention.

The American Ceramic Society should look forward to the possibility of employing one full-time man, possibly as an assistant to the Secretary, to develop this publicity. Popular articles could be issued to the current magazines and the newspapers. Such a man might easily be the means of expanding the advertising in *The Bulletin* and of increasing our membership, both Personal and Corporation. An aggressive campaign in this direction would undoubtedly benefit our Society and our industries. At this Forty-Second Annual Meeting of The American Ceramic Society, let us resolve to use the word "Ceramics" and then to extend that use through the coming years.

CORPORATION MEMBERSHIPS ARE PROFITABLE INVESTMENTS

UNITING TO ACHIEVE

- For **41 years** Personal Members of The American Ceramic Society have been exchanging technical information and have been promoting educational and research agencies to the limit of their financial abilities.
- The reason that for over **4 decades** they have rendered personal service and the reason they are paying **$12.50** annually are the values they obtain when they come together, work together, and record their findings.
- During 1939, Personal Members published **128 research reports** and **5201 abstracts** of the world-wide ceramic literature. They have done this for the industrial welfare of the ceramic corporations by whom they are employed.

CERAMIC HISTORY

HISTORY OF THE BOWMANS
O. O. BOWMAN AND HIS SONS, W. J. J. AND R. K. BOWMAN
Activities in Manufacturing a Full Line of Plumbing Fixtures

Oliver Otis Bowman was a representative of an ancient New England family which was founded in this country by Nathaniel Bowman, who, in 1630, accompanied Governor John Winthrop to Massachusetts. The name of Nathaniel Bowman appeared on the records of 1636–1637. He subsequently removed to Cambridge Farms (Lexington) and settled on land purchased from Edward Goffe in the southeasterly part of the town near the Arlington line. Nathaniel Bowman died January 21, 1682, and his will, dated October 21, 1679, and approved April 4, 1682, bequeathed the homestead to his eldest child, Francis Bowman. The historic dwelling, after withstanding the storm of two centuries and a half, was destroyed by fire in April, 1905. The descendants of Nathaniel Bowman are widely scattered and have earned for themselves distinction in many walks of life. Not only as citizens in the marketplace and the forum have they acquitted themselves in a manner worthy of their name, but on the battlefield their record has ever been an honorable one. Preeminently is this true of that representative of the race who stood, with his seven sons by his side, among the "embattled farmers" on the field of Lexington.

John D. Bowman, founder of the Pennsylvania branch of the family and grandfather of Oliver Otis Bowman, was one of the pioneers of Northampton County. About 1780, he settled in the Lehigh Valley, where he founded in Carbon County the village of Bowmantown. He was an associate judge, a leading business man of that region, and the owner of toll bridges, saw mills, and a woolen mill.

David Bowman, son of John D. Bowman, was a successful merchant, contractor, manufacturer, and coal operator. He married Susan Lentz, and they were the parents of Oliver Otis Bowman, who was born August 23, 1838, at Wilkes-Barre. In 1841, Oliver was taken by his parents to Parryville, Pennsylvania, where he received a public-school education, which was supplemented by his attendance at Weissport (Pennsylvania) Seminary.

In 1859, he succeeded the firm of Bowman Brothers and Company in the general mercantile business at Parryville, which he conducted until 1862. In that year, his store, with all of its contents, was swept away by a great flood which wrought immense destruction along the Lehigh River and throughout the Valley. Mr. Bowman, who was in the building when it was overtaken and carried away by the water, narrowly escaped with his life. He did not resume the mercantile business. He secured a contract to rebuild a part of the canal, and after the completion of this contract, in August, 1862, he served for several months in the Nineteenth Regiment, Pennsylvania Volunteers, enlisting in response to the call of President Lincoln. In 1863, he engaged in the mining of coal under the name of J. and O. O. Bowman, at Mahanoy City, Pennsylvania, and continued in this business until 1865 when he sold his interest and again undertook contract work, building several miles of the Lehigh and Susquehanna Railroad near Mauch Chunk, Pennsylvania.

Mr. Bowman married Louisa Leuckel on June 14, 1864, at Lehighton, Pennsylvania, and they were the parents of two sons, William J. J., born August 27, 1866, and Robert K., born June 4, 1868. The two sons attended the State Model Schools at Trenton, N. J. William later attended Princeton University, graduating in the class of 1888. Robert was graduated from Princeton Preparatory School and passed examinations for Princeton University, but preferred to go into business rather than to college. W. J. J. Bowman had no sons to follow him in business.

Robert K. Bowman had two sons. O. Otis Bowman, 2nd, specialized in the ceramic end of the business for a period of years and later migrated to Florida, where he has been engaged for a number of years as a manufacturers' sales agent for the Cyclone Fence Company, a subsidiary of the U. S. Steel Corporation. The other son, Robert Townsend Bowman, wished to establish himself in a business of his own and has a successful paint manufacturing plant, known as the Solfo Paint & Chemical Company, in Trenton, N. J. He is also quite prominent in civic and state affairs.

In 1867, O. O. Bowman moved to Trenton, N. J., and engaged in the manufacture of firebrick and of terra-cotta sewer pipe under the firm name of the O. O. Bowman & Company. This organization was succeeded in 1877 by the Trenton Terra Cotta Company, of which Mr. Bowman became president and treasurer. In 1894, the Trenton Fire Clay and Porcelain Company purchased the plant to manufacture heavy sanitary porcelain ware. O. O. Bowman was elected president; Robert K. Bowman, treasurer; and W. J. J. Bowman, secretary and works manager.

The companies progressed from the manufacture of firebrick and sewer pipe to machine-made pottery saggers and then fireclay porcelain ware. The main body of this ware was of fire clay with a slip covering of china and a leadless glaze. A one-fire process was used, and the ware was fired in downdraft muffle kilns.

After passing through an experimental stage, the first all-clay porcelain bathtub made in the United States was produced, together with a variety of kitchen sinks, laundry wash trays, and a few lavatories. Some years later, lavatories, sinks, and toilets were manufactured in all-vitreous china, doing away with the fire-clay body.

During this experimental stage, it was necessary to establish a laboratory to test the body and glaze materials to be used. This laboratory became an established part of the future progress of the business. A designing depart-

ment was also created to produce proper and up-to-date designs for fixtures. W. J. J. Bowman took a postgraduate course in chemistry so that he could establish and conduct a chemical and research department that would be adequate in producing the best products.

W. J. J. Bowman was a member of The American Ceramic Society.

Having produced a salable product, the next step was to find a market for the goods. At that time, all heavy porcelain baths, sinks, lavatories, etc., were imported, and but few companies handled such goods.

The J. L. Mott Iron Works of New York bought and sold the greater part of all the heavy porcelain used in this country. After some negotiations, an arrangement and agreement was made whereby the Mott organization took all of the porcelain plumbing fixtures the Company could make. This was the real start of quantity business, which resulted in a continued enlargement of plant and facilities until the three and one-half acres of land were covered with

fireproof two- and four-story buildings, kiln sheds, and a powerhouse.

As the porcelain plant was increasing its output, the Mott Iron Works wished to move the Mott Haven plant to Trenton and manufacture all of the plumbing fixtures at one place. This would allow orders to be assembled and shipped from the source of manufacture. One condition to this arrangement was that the Bowmans move the plant from Mott Haven to Trenton and build and equip a complete manufacturing plant for up-to-date enameled iron and brass and plumbing fixtures. Seven and one-half acres of land were acquired adjoining the porcelain plant and with the Bowman architect and the Bowmans acting as the general contractor, a modern and complete fireproof plant was built. A company was formed under the name, the J. L. Mott Company; O. O. Bowman was treasurer, and R. K. Bowman, assistant secretary.

At a later date, the three companies amalgamated, and the J. L. Mott Company became the holding company of the J. L. Mott Iron Works and Trenton Fire Clay & Porcelain Company. Each company, however, operated as a separate unit, and the J. L. Mott Iron Works handled the selling end of the business.

Upon the death of J. L. Mott, his son, J. L. Mott, Jr., became head of the Company. Mr. Mott, Jr., and his sister, Mrs. McLean, inherited the larger stock holding of the Company, but there was little or no harmony between brother and sister. This resulted in lawsuits brought by the sister against the brother and the Company, hampering the business for some years.

A few years later, the death of John Ried, the general manager of the J. L. Mott Iron Works, required new officers to be elected. J. L. Mott, Jr., became president of the J. L. Mott Iron Works and of the J. L. Mott Company; O. O. Bowman was treasurer of the J. L. Mott Company; R. K. Bowman, general manager and treasurer of the J. L. Mott Iron Works and vice-president and general manager of the J. L. Mott Company; and W. J. J. Bowman, general works manager and secretary of the J. L. Mott Company.

This placed R. K. Bowman as the executive head of the business and W. J. J. Bowman in charge of manufacturing.

New designs in fixtures increased a variety of shapes, and a built-in, all-porcelain bath was produced, the first of its kind in the United States or Europe. This stimulated the output of porcelain baths. At that time, all iron-enameled baths were made to set away from the wall. There was such a demand for built-in bathtubs that the manufacturers of iron enameled baths, as well as the Mott Company, started to produce the iron-enameled built-in baths. Today there are few made that are not of the built-in design.

The lawsuits brought by Mrs. McLean continued for years, and Mr. Mott finally compromised with his sister, allowing her to appoint a general manager and dictate the running of the business. Under this management, the Company did not seem to thrive except in enlarged indebtedness, resulting in a receivership after a little over two years of her dictation.

R. K. Bowman and Charles H. Baker, who were appointed receivers, continued to operate the business successfully for over two years, at which time it was sold as a successful business with quite a formidable bank balance and over one million dollars in unfilled orders. The purchasing company was unsuccessful and soon went into receivership, and from that date, the plant has not been operated. Thus ends the manufacture of the Mott plumbing fixtures and of the Bowman activities connected with it.

There is but one of the officers of the three companies who is living, R. K. Bowman. He has been retired from business activities since 1928. No mention is made of the other officers or employees of these companies as this article relates only to the Bowman activities.

SOME EARLY EXPERIENCES IN ENAMELING CAST IRON

By E. L. Dawes

As far as the early history of the enameling industry is concerned, I know but little outside of the sanitary line. My knowledge of this industry began some sixty years ago. At that time, the J. L. Mott Iron Works was the only plant in this country that made any pretense to produce enameled sanitary ware, and I do not know whether they had aspired to produce a bathtub as early as 1879.

But in that year, the Standard Sanitary Manufacturing Company, where I was employed first as a bookkeeper and later as manager, made one to two cast-iron tubs per day. We had but one style which was known as the "prison" tub. They were too cold for comfort, etc. Of this daily production of two tubs, few were enameled, the greater part of the production being painted and galvanized.

The old River Avenue property in Allegheny (now Pittsburgh) was built in 1870 by Ahlborn, Hartje, Wiley & Company to produce enameled stove (cast-iron) hollow ware. The Company failed in the panic of 1873, and in 1875 the property was bought at a sheriff's sale by the late James W. Arrott and Francis Torrance and was operated as the Standard Manufacturing Company. Mr. Arrott was the father of the Arrotts, who now own and run the United States Sanitary Manufacturing Company, and Mr. Torrance was the father of the late Francis J. Torrance.

The Standard's business was about 95% enameled stove hollow ware; the other 5% consisted of 3% miscellaneous castings and about 2% in the plumbing industry, mostly in few patterns of water-closet hoppers and washstands for factory use. Only a few of these were enameled, the majority being painted.

Up until this time, little was known of making enamel except a very soft, leadless enamel for cooking utensils. But in about 1879, the wood-pump industry took on a boom and created a large demand for enameled-iron cylinders. This business was divided between a small enameling company, which was a split from the Ahlborn, Hartje, Wiley & Company at the time of its failure and the "Standard." It was soon learned that in the soft glass used in the hollow-ware industry, the soluble constituents in the enamel or glass dissolved and the enamel became so rough that it would wear out the leather suckers. This was about the first time that there was recognition of the necessity to put some thought into the "whys" and "wherefores" of the ingredients to make a nonsoluble mixture, and it was the first effort on our part to eliminate the soluble fluxes and to incorporate insoluble fluxes.

This pump-cylinder business flourished for several years until drawn brass tubing took the place of the enameled cylinders. With the loss of this business it was necessary to find something to take its place, and this was the time and opportunity to embark in the manufacture of enameled plumbing goods. About 1883 or 1884, the Standard added to its line several styles of lavatories, water-closet hoppers, and one pattern of bathtub. This was made in what was then known as the French pattern, and the design followed closely the pattern or design of the old copper tub. It was made with a hardwood rim fastened on with wood screws, and the molder who could make such a tub was considered to be very skillful. We (the Standard) started an aggressive campaign to make a business out of the plumbing industry. To encourage the jobbing trade, we guaranteed stock in warehouses against defects, damage, price, etc.

In embarking in the manufacture of tubs and other plumbers' ware, it was necessary to discontinue the use of the hollow-ware enamel and to make enamel that was white and flexible. The cylinder and hollow-ware enamels were blended. Up to this time, the ware made by the Mott Iron Works was first coated with a very soft and porous coat, known as "bone coat," so porous that it took on rust which showed through the enamel as a discoloration, similar to lime spots.

The enamel was applied by mixing it with alcohol which would evaporate quickly, floating it on the ware. This proved to be an unsatisfactory process, but as long as the business was limited, there was no object in trying other ways.

It was in about 1882 or 1883 that August Haarlander, the enameling foreman, and the writer commenced experimenting to make an enamel that could be dredged on the article (as is now done) and which, with improvements and modifications, is the method followed today. Even at that time, there was but little thought of the ultimate future of the industry. At the time I severed my connections with the Standard Company, we had not made more than ten or fifteen tubs per day and lavatories in like proportion.

In 1887, the writer and the late W. A. Myler, who was the accountant of the Standard Manufacturing Company from 1881 until 1887, built the plant at New Brighton, Pa., known as the Dawes & Myler Works. Even at this time the growth in the business was so slow that we started to make enameled stove hollow ware, and it was not until about 1890 that we put in patterns to make bathtubs. From that date, the business grew rapidly—so rapidly

that, when the New Brighton factory was burned in 1893, in rebuilding, the plant was constructed to make enameled sanitary goods exclusively. The demand for enameled baths, lavatories, and other sanitary goods had increased to such an extent that it was necessary to find means to increase production and at the same time to reduce costs so that the modern appliances would be in reach of the masses.

The output of the enameling plants of the country prior to 1900 was very small compared to present-day production. There were fewer plants and the capacity of each plant was small. The production of bathtubs by the Standard Manufacturing Company, which was the largest producer in the world, was 45 tubs per day in 1893 and about 150 per day in 1899. This appears small compared to the present capacity of 2000 tubs per day of the American Radiator and Standard Sanitary Manufacturing Corporation.

Shortly before 1900, John C. Reed, who was then manager of the Standard Manufacturing Company plant in old Allegheny (now North Side, Pittsburgh, Pa.) conceived the idea of making tubs by what is commonly known as the "match-plate system." The process was new and unique and was patented by Reed. About the same time, James W. Arrott, Jr., patented an automatically actuated dredger. By these two inventions, the output was largely increased. Prior to that time, a molder would make two bathtubs per day. By the Reed process, four men produced some 36 tubs per day of eight hours. The automatic dredge added largely to the speed of the output, which up to that time was one bathtub per hour or 24 tubs per furnace per day of twenty-four hours.

Other improvements were also injected into the shops; a mechanically operated table on which the red-hot tubs were enameled and other improvements from time to time have reduced to one half the number of workers on a furnace. The furnaces, which at that time could heat only one tub an hour, were improved upon from time to time, until at the present time three or four tubs per hour are obtained.

While these manufacturing improvements were going on, the management was making improvements in designs. At first, the tubs were made with wood rims. From wood the enameled roll rim was evolved; from the tub on feet, the one-piece tub, enameled inside and out, changing the bathroom from a room for bathing purposes only into the pride of the house owner. The lavatory, with the slab and bowl cast in two pieces and butted together making an unsanitary and unsightly job, has grown into the beautiful one-piece lavatory of the present day.

While a number of the men who laid the foundation for the large industry of the present day have passed away, the real life of the business is so recent that those who were so instrumental in its growth are still actively engaged in the business.

I have passed over the organization of the Standard Sanitary Manufacturing Company in 1900. At that time, the largest producers of enameled sanitary ware in the country were the Standard Manufacturing Company of Pittsburgh, Pa., the Ahrens & Ott Manufacturing Co.,* of Louisville, Ky., and Dawes & Myler, of New Brighton, Pa. At the time of combining to form the Standard Sanitary Manufacturing Company, they bought up several other companies and consolidated such equipment as could be used in the three plants. The plants thus bought were scrapped and sold.

From the time of its formation, this Company has maintained its position as the largest producers of enameled-iron sanitary ware in the world, and has contributed its share to the development of the industry during the past forty years.

Just as we realize that there were others instrumental in founding the sanitary enameling industry in this country, just so are we fully aware that other companies have contributed to its later development. We take this occasion to express our appreciation of the ability and energy of our competitors.

STANDARD SANITARY MANUFACTURING COMPANY
CHICAGO, ILLINOIS

* For a story of Theodore Ahrens, see *The Bulletin*, **17** [9] 368 (1938).

MODERN PIONEER AWARDS

"MODERN PIONEERS" IN WHOM CERAMISTS ARE INTERESTED

Edward Bausch, Bausch & Lomb Optical Co., Rochester, N. Y.
*__Willis Haviland Carrier,__ Carrier Corp., Syracuse, N. Y.
William David Coolidge, General Electric Co., Schenectady, N. Y.
*__Frederick Gardner Cottrell,__ Washington, D. C.
William Austin Darrah, Continental Industrial Engineers, Inc., Chicago, Ill.
‡__Frank Joseph Dobrovolny,__ E. I. du Pont de Nemours & Co., R. & H. Chemicals Dept., Niagara Falls, N. Y.
*__John Van Nostrand Dorr,__ Dorr Co., Inc., New York, N. Y.
‡__Albra Henry Fessler,__ A C Spark Plug Div., General Motors Corp., Cleveland, Ohio
Colin Garfield Fink, Columbia University, New York, N. Y.
Harold William Greider, The Philip Carey Manufacturing Co., Lockland, Ohio
Ralph Emmons Hall, Hall Laboratories, Inc., Pittsburgh, Pa.
William Jacob Harshaw, The Harshaw Chemical Co., Cleveland, Ohio
Russell Pearce Heuer, General Refractories Co., Philadelphia, Pa. (see p. 179, this issue)
Lowell Cleland Hewitt, Laclede-Christy Clay Products Co., St. Louis, Mo.
†__John W. Iliff,__ The Harshaw Chemical Co., Cleveland, Ohio
*__Charles Franklin Kettering,__ General Motors Corp., Dayton, Ohio
Thure Larsson, Norton Co., Worcester, Mass.
Clesson E. Mason, The Foxboro Co., Boston, Mass.
Morris Evans Leeds, Leeds & Northrup Co., Philadelphia, Pa.
‡__Taine G. McDougal,__ A C Spark Plug Div., General Motors Corp., Detroit, Mich.
Edwin Fitch Northrup, Ajax Electrothermic Corp., Trenton, N. J.

*National Modern Pioneer (nineteen persons were singled out for this special award; 572 received the Modern Pioneer Award).
†Joint Award, Modern Pioneer.
‡Honorable Mention.

Karl Ernest Peiler, Hartford-Empire Co., Hartford, Conn. (see the March *Bulletin*, p. 105)
†**Maurice W. Phelps,** Solvay Process Corp., Syracuse, N. Y.
Carl F. Prutton, The Lubri-Zol Corp., Cleveland, Ohio (also Case School of Applied Science)
Wilbur B. Rayton, Bausch & Lomb Optical Co., Rochester, N. Y.
Raymond Ronald Ridgway, Norton Co., Niagara Falls, N. Y.
Thomas Willett Rolph, Holophane Company, Inc., Newark, Ohio
Carlisle K. Roos, United States Gypsum Co., Chicago, Ill.
†**Charles Baldwin Sawyer,** The Brush Laboratories Co., Cleveland, Ohio
‡**Karl Schwartzwalder,** A C Spark Plug Div., General Motors Corp., Detroit, Mich.
Games Slayter, Owens-Corning Fiberglas Corp., Newark, Ohio (see the March *Bulletin*, p. 106)
L. R. Smith, A. O. Smith Corp., Milwaukee, Wis.
Eugene Cornelius Sullivan, Corning Glass Works, Corning, N. Y.
William C. Taylor, Corning Glass Works, Corning, N. Y.
Edgar D. Tillyer, American Optical Co., Southbridge, Mass. (see p. 180, this issue)
†**Karl Turk, Sr.,** The Porcelain Enamel and Mfg. Co., Baltimore, Md. (see this issue, p. 180)
†**Richard Turk,** The Porcelain Enamel and Mfg. Co., Baltimore, Md.
***John B. Tytus,** The American Rolling Mill Co., Middletown, Ohio
Willis R. Whitney, General Electric Co., Schenectady, N. Y.

RUSSELL PEARCE HEUER NAMED MODERN PIONEER IN PHILADELPHIA

Education

R. P. Heuer is a native of Philadelphia. He attended the University of Pennsylvania and received his Bachelor's degree in Chemical Engineering in 1917. After graduation, he was first employed in chemical manufacturing plants but later became associated with copper and brass rolling mills where he specialized on electric-melting furnaces. During the year 1919, he continued his education with graduate study at the Columbia University School of Mines, and in 1922, he returned to his alma mater as an instructor in Chemistry under the late Edgar Fahs Smith.

At Pennsylvania, he carried on research in copper metallurgy and electric furnaces, with special emphasis on the refractory materials used in electric-furnace construction.

During the period 1923 to 1927, he continued his graduate study in chemistry giving particular attention to physical chemistry, and in 1927 he received the degree of Doctor of Philosophy. His doctorate thesis dealt with the preparation and some of the properties of oxygen-free copper. In this research, the hitherto unsuspected action of small amounts of iron impurity in rapidly depressing the electrical conductivity of oxygen-free copper was revealed together with a way of overcoming the difficulty in commercial operation.

With General Refractories Company

In 1927, Dr. Heuer joined the General Refractories Co., Philadelphia, Pa., as Director of Research to become more closely associated with the development of certain of his inventions concerning refractory materials. In 1936, he was elected to the Board of Directors and became a vice-president of that Company.

Refractories Patents Granted

Dr. Heuer has been granted more than forty U. S. patents covering many diverse fields of activity. The largest group of patents relates to the manufacture of refractories. In this field, he is best known for the development of the Ritex process for the manufacture of magnesite and chrome refractories without kiln firing. He was the first to apply to unfired-brick manufacture the principles of "gap" grain-sizing, high molding pressure, and the use of multiple-bonding agents for all temperature ranges. The advantages of the Ritex process with its rapid rate of production, lower costs, and better quality of product, especially as related to spall resistance, volume stability, lower thermal conductivity, and lower gas permeability are well known to refractories users. The commercial importance of the process is attested to by the phenomenal growth in production of these new products. Additional refractories inventions relate to the manufacture of silica brick, kaolin, fireclay, diaspore, and other products, as well as to the well-known basic suspended furnace-roof construction, basic rotary kiln linings, etc.

R. P. Heuer, Vice-President, General Refractories Company

Metallurgical Patents

In the metallurgical field, Dr. Heuer holds many patents covering the production of oxygen-free copper, the use of continuous furnaces, preheating means, etc., in the melting of copper cathodes. His most recent patents in this field relate to the production of pig iron, using acid blast-furnace operation and the desulfurization of the iron thus made by a special treatment external to the blast furnace. Many new blast furnaces are now being built in Germany for smelting siliceous ores, using the acid process under their "four-year plan" of self-sufficiency. The Germans have used soda ash as the desulfurizing agent. Dr. Heuer has demonstrated that better desulfurization at a much lower cost may be obtained with lime slag. By suitably increasing the reducing conditions under which the desulfurizing action takes place, he has been able to intensify the activity of the lime slag. Thus the waste slag from the blast furnace itself, with inexpensive addition agents, can be used. Under the most favorable conditions, he has obtained pig iron much lower in sulfur content than ever produced before, namely, less than 0.0005% sulfur.

Membership

In addition to membership in The American Ceramic Society, Dr. Heuer is a member of the American Institute of Chemical Engineers, American Institute of Mining and Metallurgical Engineers, American Chemical Society, Electrochemical Society, American Society for Testing Materials, British Ceramic Society, and Deutsche Keramische Gesellschaft. He also is a member of Sigma Alpha Epsilon, Sigma Xi, Philadelphia Country Club, Penn Athletic Club, and the Mining Club of New York.

FATHER AND SON RECIPIENTS, KARL TURK, SR., AND RICHARD H. TURK

The climax of the Modern Pioneers Dinner, held at the Belvedere Hotel, Baltimore, Md., was the awards of merit to father and son, Karl Turk, Sr., President of The Porcelain Enamel & Manufacturing Company and a Fellow of The American Ceramic Society; and his son, Richard H. Turk, Executive Vice-President of the Company, a member of the Board of Trustees of the Porcelain Enamel Institute, and a Fellow of The American Ceramic Society.

Karl Turk and his son, Richard, are said to be one of the few, if not the only father and son in the same industry in the entire country to receive recognition for their accomplishments in science and invention. Both father and son have been engaged in the manufacture of porcelain enamel from the beginning of their careers.

Karl Turk, Sr. (left) receiving certificate, and Richard H. Turk (center) whose award has just been presented by Chester F. Hockley, Chairman of Committee of Modern Pioneers

Work of Karl Turk, Sr.

Karl Turk, Sr., has been given credit as the founder of the industry which made possible the commercial application of porcelain enamel in the wet state to cast iron, thus enabling the manufacturers of ranges, refrigerators, washing machines, and other porcelain-enamel products to buy and use porcelain enamel instead of producing it in small quantities in their own plants. The founding of this industry thirty years ago marked the beginning of the porcelain enameling industry as we know it today.

Of his patented inventions, possibly the most important was the method of improving the opacity of porcelain enamels by increasing their covering power, thereby making it possible to increase the whiteness of enameled articles and to decrease the thickness of the application. This has effected a saving in manufacture, owing to the reduction of materials used, number of operations required, and losses from rejected materials.

With the improvement in beauty, utility, and the life of the porcelain-enamel product made possible by this invention, the number of industries using it increased rapidly. His other inventions included many which increased the use of porcelain enamel, improved its manufacture, and reduced the cost of application. As a founder of this new American industry, he has made possible the employment of thousands of persons throughout the United States and foreign countries, thus contributing to the progress of industry. Mr. Turk is also the author of several textbooks on porcelain enamels and enameling.

Work of Richard H. Turk

The award to Richard H. Turk, like his father's, was made for "distinguished achievement in the field of science and invention which has advanced the American standard of living." Noteworthy among his contributions to the porcelain-enameling and related industries was the development of a process which permitted the continuous production of porcelain enamels. Before Mr. Turk's invention, enamels were smelted in rotary or batch-type smelters, which carried a load of only 2000 pounds. The control of this type of smelter depended largely on the individual skill of the operator. Mr. Turk's invention made possible the continuous smelting of porcelain enamels of unvarying uniformity. As a result of the invention of the continuous process, the standards of the entire industry have been raised, thereby opening still wider fields for the uses of porcelain enamel.

Mr. Turk was also a leader in the movement to eliminate poisonous compounds such as lead and arsenic from porcelain enamel, with its subsequent benefit to mankind. These inventions, while fundamental, were not patented by Mr. Turk because he believed their benefits should be made available to the entire industry for its advancement.

Another of Mr. Turk's patents covers a new type of decorative finish, suitable for application to all types of sanitary ware, kitchen equipment, and building units. Like his father, he has made a number of discoveries which have contributed to the advancement of the porcelain-enamel industry.

The scrolls were signed by Karl T. Compton, Massachusetts Institute of Technology, Chairman, Committee on Modern Pioneer Awards. The awards were made by Chester F. Hockley, Chairman of the Maryland Committee of Modern Pioneers. Herbert Wagner, Chairman of the Board of the Consolidated Gas, Electric Light and Power Company of Baltimore, is also President of the Maryland Academy of Sciences, who sponsored the event jointly with the Regional Modern Pioneer Awards Committee of the National Association of Manufacturers. Charles R. Hook, President of the American Rolling Mill Company, Middletown, Ohio, was the principal speaker.

EDGAR D. TILLYER

Edgar D. Tillyer, Sc.D., American optical research scientist, is best known for his development of the Tillyer lens, which corrects marginal astigmatic and focal errors. His many other contributions to the arts and sciences are found among his one hundred and twenty-five patents.

He has developed glass compositions for lenses which absorb ultraviolet and infrared rays, and his analysis of deep-curve aviation lenses resulted in the elimination of prismatic displacement, providing greater accuracy of army and navy gunners.

He assisted in the development of the Lensometer, which checks the accuracy of lenses, and he has invented monocentric and other bifocal lenses which reduce image displacement.

His life has been devoted to important developments not only in optics, but in astronomy, military fire control, radio, motion pictures, and television.

Dr. Tillyer, a graduate of Rutgers University, was awarded an honorary degree of Doctor of Science by his Alma Mater in recognition of his outstanding contributions to science, not only in optics, but in arts as widely separated as radio, moving pictures, and television.

As an astronomical observer at the Naval Observatory in 1907, Dr. Tillyer contributed two important developments. One, an improved clock-vault temperature control, resulted in more accurate standard time for the United States, while the other, a system of reversing prisms for meridian circle observations, eliminated personal error, provided more consistent data, simplified the technique, and saved appreciable time in making observations.

After leaving the Naval Observatory in 1911, Dr. Tillyer entered the United States Bureau of Standards, where he was responsible for the design and improvement of all image-forming instruments. He redesigned and revised the old types of submarine periscopes, increasing their field of vision and illumination, originated the first specifications to standardize periscopes and gunsights used by the United States Navy, and served in the capacity of consultant for both the Army and Navy in the design and purchase of optical instruments.

Outstanding and typical of Dr. Tillyer's war work directly after his affiliation with the American Optical Company in 1916 was his contribution in making possible the manufacture of the 37-mm. French telescopic gunsight in the United States, a problem which various lens manufacturers in the United States had called impossible owing to the absence of a domestic supply of barium glass from

E. D. Tillyer, Research Director, American Optical Company

which these sights were made. Within a few days after Dr. Tillyer became acquainted with this important wartime problem, he returned the solution to the government, having redesigned a sight, using a common type of domestically available optical glass. The Tillyer modification of the French gunsight was adapted to large-scale production and was reported by the French government as being more efficient than their own made of barium glass.

While at the American Optical Company, Dr. Tillyer has made important contributions, many of them basic, to the advancement of better vision, industrial eye protection, and the optical sciences. He has been granted by the United States Patent Department one hundred and twenty-five patents in the various arts. Those cited here are a representative example of the type of work Dr. Tillyer has done. The economic and social significance of his work is best illustrated by general reference to specific accomplishments.

In the creation of the Tillyer lens, Dr. Tillyer provided for the first time an ophthalmic lens, corrected for marginal astigmatic and focal error which could be made on a production basis. A better prescriptive lens, accurate from edge to edge, was thus made available at a moderate price.

The Ful-Vue and the monocentric bifocal lenses, conceived by Dr. Tillyer, are appreciated by anyone required to wear bifocal lenses for their elimination of visual jump and prismatic displacement; and in the case of the Ful-Vue two-piece bifocal, for its cosmetic improvement in that the bifocal segment is virtually unnoticeable.

Dr. Tillyer's approach to the solution of iseikonic lenses for correction of size-shape difference and refractive error resulted in making the design and application of these lenses commercially practical and eliminated a cumbersome graphical method of computation originally involving 5000 feet of chart.

The invention of the glass heat screen, which will transmit light rays and retard heat rays, introduced an outstanding improvement in the design of moving-picture projectors. Through the use of this screen, films are protected against burning when the machine is stopped, and the still projection of any portion of a movie film has been made possible without loss of light or detail.

In the Tillyer design of the retinoscope, an instrument used in eye refraction, his development of a transparent reflector for transmitting light while permitting vision through it gave the optometrist an instrument eliminating light shock to the patient's eye and affording him a better view and more accurate diagnosis. All the better retinoscopes are made on this principle today.

As in the case of the retinoscope, more precise diagnostic work with more accurate prescriptive correction for the patient developed as a result of Dr. Tillyer's design of an additive series of Trial Set Lenses. The use of these additive trial set lenses also made obsolete the cumbersome and difficult computations formerly involved.

Pioneering in radio, in contradiction to all theory, Dr. Tillyer conceived a method of cutting quartz crystals, eliminating the waste experienced through cutting them by the then accepted method and provided a crystal which could be manufactured readily with any range of constant high- or low-frequency oscillation. This development has been of considerable importance to work done by the American Telephone and Telegraph Company and the General Electric Company in the communication field.

Dr. Tillyer's basic conception and development of an ultraviolet, infrared absorption lens with selected high visible light transmission represents the first effective approach to the present-day high-grade sunglass lens. The combined effect of ultraviolet and infrared on the eye causes discomfort and eye injury.

In Dr. Tillyer's analysis and correction of zero-power, deep-curve lenses to eliminate prismatic displacement, a new optical principle was established, viz., that of the necessity of decentering zero-power deep-curved lenses. These lenses, used by both the Army and Navy Air Corps in their aviation goggles, improved gunner's accuracy and eliminated aviator's headache, formerly caused by the prismatic displacement of the uncorrected lenses.

(1940)

ACTIVITIES OF THE SOCIETY

JOHN L. CARRUTHERS, PRESIDENT

John L. Carruthers, Professor of Ceramic Engineering, Ohio State University, has been elected President of The American Ceramic Society for 1940–1941.

John Litster Carruthers was born on July 25, 1895, at Lafayette, Colo. He attended the Lafayette and Denver, Colo., public schools. Following his graduation from the North Side High School in Denver in 1913, he was employed at the Pullman Company in Denver for one year.

In 1914–1915, he attended Ohio State University, returning to Denver for two years (1915–1917) to work as plant engineer for the Denver Terra Cotta Company. In 1918, he served in the United States Army Air Service.

In the summer of 1920, he was engineer with the Radium Corporation of Colorado in Denver, where he was designer and supervisor of the erection of roasting furnaces, grinding mills, and buildings for iron vanadate production.

Following his graduation from Ohio State University in 1921, where he received his Bachelor's degree in Ceramic Engineering, Professor Carruthers returned to the Denver Terra Cotta Company as ceramic engineer. Here he was engaged in development work on bodies, plant cost control systems, and was engineer in charge of mine development. From 1922 to 1925, he was employed by the Harrop Ceramic Service Company, Columbus, Ohio, to erect, design, and service tunnel-kiln installations in various parts of the United States (Ohio, Maryland, Pennsylvania, Michigan, Utah, and California).

John L. Carruthers, President, 1940–1941

In 1925, Professor Carruthers became associated with the Department of Ceramic Engineering at Ohio State University as assistant professor; in 1930, as associate professor; and from 1936 to the present time, professor.

Professor Carruthers received the professional degree of Ceramic Engineer in 1934. He is also a registered ceramic and structural engineer in the State of Ohio.

He became a member of The American Ceramic Society in 1922 and a Fellow in 1933.

Offices in The Society

He has held the following offices in The Society: Chairman, Structural Clay Products Division, 1934–1935; Chairman, Terra Cotta Division, 1935–1936; Trustee, Terra Cotta Division, 1936–1939; and Vice-President of The Society, 1939–1940. He was also Chairman of the Founder's Group of the Institute of Ceramic Engineers in 1937, Vice-President of the Institute in 1938–1939, and President, 1939–1940.

Professor Carruthers is a member of the Society for the Promotion of Engineering Education (first Chairman of the Ceramic Division of the Mineral Technology Group), the Ohio Ceramic Industries Association, the Association for Ceramic Educators, Sigma Xi, and Keramos.

Publications

"Notes on Shivering of Terra Cotta," *Jour. Amer. Ceram. Soc.*, **5** [8] 518–26 (1922).

"Use of Forced Draft for Terra-Cotta Kilns," *ibid.*, [7] 449–54.

"Economics of the Car Tunnel Kiln," *Bull. Amer. Ceram. Soc.*, **4** [12] 668–76 (1925).

"Drier Problems with Calculations," *Jour. Amer. Ceram. Soc.*, **14** [1] 8–20 (1931).

"Laboratory Test Kilns" (with A. S. Watts), *ibid.*, **15** [2] 154–57 (1932).

"Water-Smoking Period and Its Control," *ibid.*, **18** [4] 113–17 (1935).

"Loading Device for Load-Test Furnace," *ibid.*, **19** [2] 36–38 (1936).

"Drying Problems of the Ceramic Industry," *Trans. Amer. Soc. Mech. Engrs.*, **57** (PRO-3) 439 (1935); *Ceram. Abs.*, **15** [3] 98 (1936).

JESSE TALBOT LITTLETON, VICE-PRESIDENT 1940–1941

Jesse Talbot Littleton, Assistant Director of Research of the Corning Glass Works, was born July 7, 1887, at Belle Haven, Virginia. His early education was obtained from private tutors. He was graduated from Southern University, Greensboro, Ala., 1906, with the degree of A.B.; from Tulane University, of Louisiana, 1908, M.A.; University of Wisconsin, 1911, Ph.D.

He was laboratory assistant at Southern University, 1905–1906; Research Fellow at Tulane University, 1906–1908; Research Fellow, University of Wisconsin, 1908–1909; Assistant in Physics, University of Wisconsin, 1909–1911; Instructor in Physics, University of Michigan, 1911–1913; Physicist, Corning Glass Works, 1913–1920; Chief of Physical Laboratory, Corning Glass Works, 1920–1940; Assistant Director of Research, Corning Glass Works, 1940–.

Among his local affiliations are member Methodist Episcopal Church; Lions Club: charter member, 1926,

President, 1929, and District Deputy Governor, 1934; Director of Corning Chamber of Commerce, 1935–1938; Secretary of Corning Fish and Game Club, 1925; member of Sigma Xi and Gamma Alpha honorary scientific fraternities.

His scholastic and technical associations are numerous: Fellow, American Physical Society; Fellow, American Association for the Advancement of Science; Fellow, American Institute of Electrical Engineers; Fellow, American Optical Society; Fellow, American Ceramic Society.

Chairman, Glass Division, American Ceramic Society, 1929–1931; Member, Advisory Committee on Applied Physics, American Physical Society, 1935–1939; Member, Editorial Staff, *Journal of Applied Physics*, 1937–1938; Licensed engineer, 1937–.

Chairman, Publications Committee, American Ceramic Society, 1932; Trustee, American Ceramic Society, 1935–1938.

Member, Physics Committee, National Research Council, 1930 to date; Member, Chemical Committee, National Research Council, 1930 to date; Member at Large, Ithaca Section of A.I.E.E.; Licensed Engineer, New York State, 1936–; Member, Deutsche Glastechnische Gesellschaft; Member, American Society for Testing Materials; Chairman, Section 4 of Committee D14 on Glass, A.S.T.M.

He has received patents on various glass articles and processes. In 1933, as co-author with G. W. Morey, he published the book, The Electrical Properties of Glass. He has also added to the literature of glassmaking by contributing 11 papers to various scientific and technical journals. One in particular should be mentioned here, "A Review of Recent Progress in the Study of Thermal Treatment of Glass" (*Jour. Soc. Glass Tech.*, **15**, 262–306 (1931)) by invitation of the British Glass Research Association Fund. Also, as co-author with other scientists, he has published 14 papers and monographs of value to the craft of glassmaking and glass technology. He was one of two scientists from this country invited to address the International Glass Congress in London in July, 1936.

On December 28, 1912, he married Bessie Cook of Columbus, Mississippi. Mrs. Littleton is a graduate of Mississippi State College for Women, 1907, B.S., and is active in local church and Sunday-school work. She holds membership in the Corning University Women's Club and the Corning Women's Club, member of Country Club. Children, Martha Elizabeth; Jesse Talbot, 3rd; Joseph Cook; Harvey Kline.

Dr. Littleton is interested in sports of all types. He also holds membership in the Corning Country Club.

J. T. Littleton, Vice-President, 1940–1941

Publications

"Optical Constants of Alloys as a Function of Composition," *Phys. Rev.* [Series 1], **33** [6] 453–66 (1911).

"Notes on Optical Constants of Metals," *ibid.* [Series 1], **35** [4] 306–11 (1912).

"New Method for Measuring Tensile Strength of Glass," *ibid.* [Series 2], **22,** 510–16 (1923).

"Relative Magnitude of Radiation and Convection Heating in a Muffle Kiln," *Jour. Amer. Ceram. Soc.*, **6** [7] 771–76 (1923).

"Method for Measuring Softening Temperature of Glasses," *ibid.*, **10** [4] 259–63 (1927).

"Review of Recent Progress in Study of Thermal Treatment of Glass," *Jour. Soc. Glass Tech.*, **15,** 262–306 (1931).

"Critical Temperatures in Silicate Glasses," *Ind. Eng. Chem.*, **25,** 748–55 (1933).

"Melting and Annealing of Glass," *Proc. 3rd Penna. Min. Ind. Conf., Ceram. Sect.*, Oct. 20–21, pp. 28–38 (1933).

"Physical Processes Occurring in Melting and Cooling of Glass," *Jour. Amer. Ceram. Soc.*, **17** [3] 43–49 (1934).

"Effect of Temperature on Glass-to-Metal Seals," *ibid.*, **18** [8] 239–45 (1935).

"Effect of Heat Treatment on Physical Properties of Glass," *Bull. Amer. Ceram. Soc.*, **15** [9] 306–11 (1936).

(With L. R. Ingersoll) "New Method of Determining Optical Constants of Metals and Optical Constants of Silicon," *Phys. Rev.* [Series 1], **31** [11] 489–99 (1910).

(With H. C. Bates) "Relative Efficiency of Pyrex Glass and Metal Condenser Tubes," *Trans. Amer. Inst. Chem. Engrs.*, **17,** 95–106 (1926).

(With H. C. Bates) "Heat Transfer Through Industrial Glass Tubes," *Chem. & Met. Eng.*, **39,** 315–18 (1932).

(With G. A. Dasney) "Extending Life of Chemical Glassware," *Ind. Eng. Chem.*, **19,** 1271 (1927).

(With G. W. Morey) Electrical Properties of Glasses. Monograph of National Research Council. John Wiley & Sons, Inc., 1933. 180 pp.

(With L. C. Nicholson) "Power Arc Tests on Insulators," *Elec. World*, **87,** 1054–56 (1926).

(With C. J. Phillips) "Electrical Range Oven Performances," *ibid.*, **100,** 527–29 (1932).

(With F. W. Preston) "Theory of Strength of Thermally Toughened Glass," *Trans. Soc. Glass Tech.*, **13,** 336–49 (1929).

(With Evelyn Roberts) "Annealing Temperature of Glass," *Optical Soc. Amer.*, **4,** 224–29 (1920).

(With W. W. Shaver) "Temperature of Pyrex and Porcelain in Sunlight," *Jour. Amer. Ceram. Soc.*, **9** [9] 618–25 (1926).

"Dielectric Puncture Under Oil," *Elec. World*, **90,** 503–35 (1927).

(With W. W. Shaver) "Effect of Humidity on Dry Flashover Potentials of Pin-Type Insulators," *Trans. Amer. Inst. Elec. Engrs.*, **47,** 438–41 (1928); discussion, pp. 441–45.

"Puncture Tests Affected by Strength of Oil," *Elec. World*, **91,** 759 (1928).

(With W. L. Wetmore) "Electrical Conductivity of Glass in Annealing Zone as a Function of Time and Temperature," *Jour. Amer. Ceram. Soc.*, **19** [9] 243–45 (1936).

Patents Issued

Number	Date of Issue	Title	Case
1,483,461	2-12-24	Heat Treatment of Glass Articles (Air Chilling)	2
1,514,668	11-11-24	Spark Plugs	3
1,525,453	2-10-35	Process of Making Spark Plugs	1
1,543,779	6-30-25	Manufacture of Insulators (co-inventor with G. S. Fulcher)	4-2
1,635,186	7-12-27	Spark Plugs	5
1,681,991	8-28-28	Method of Detecting and Measuring Strains	9
1,722,010	7-23-29	Method and Apparatus for Perforating Glass (co-inventor with C. R. Smith)	1
1,728,350	9-17-29	Refractory Products and Method of Making the Same	6
1,808,047	6- 2-31	Method of Making Bearings (co-inventor with R. W. Lillie)	11-1
1,981,560	11-20-34	Method and Apparatus for Cooling Glass (Method of Straining Glass)	16
1,995,993	3-26-35	Vacuum Bottle	19
1,999,770	4-30-35	Glass Strainer or Sieve	20
2,042,610	6- 2-36	Method and Apparatus for Tempering Glass (Method of Straining Glass)	17
2,118,795	5-24-38	Insulators	14
2,133,768	10-18-38	Insulator (No-Static Coating) (co-inventor with J. C. Hostetter)	25-2

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Sectional Committee on Classification of Coals (Project M-20): W. H. FULWEILER, 1600 Arch St., Philadelphia, Pa.
Sectional Committee on Scientific and Engineering Symbols and Abbreviations (Project Z-10): L. E. BARRINGER, General Electric Co., Schenectady, N. Y.
Sectional Committee on Specifications for Sieves for Testing Purposes (Project Z-23): A. S. WATTS, Ohio State University, Columbus, Ohio
Sectional Committee on Specifications and Methods of Test for Safety Glass (Project Z-26): A. E. MARSHALL, 501 Fifth Avenue, New York, N. Y.; DONALD E. SHARP (*alternate*), Hartford-Empire Co., Hartford, Conn.

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Anderson, George H., Texas Power & Light Co., Dallas, Texas; geological economist.

Andreson, Laura, Univ. of California, Los Angeles, Calif.; art instructor.

Barr, Harry, 5746 Kenmore Ave., Chicago, Ill.; western representative, Consolidated Feldspar Corp.

Bergdoll, John, Garfield Refractories Co., 30 Church St., New York, N. Y.

Brian, Richard, 338 Indiana Ave., Chester, W. Va.; salesman, Harshaw Chemical Co.

Butler, James F., 571 Berkley St., Camden, N. J.; production manager, Camden Pottery Div., Universal Sanitary Mfg. Co.

Doyle, Michael W. E., Battelle Memorial Institute, Columbus, Ohio; ceramic engineer.

*Fallon, Frank J., 2866 McKoon Ave., Niagara Falls, N. Y.

Findlay, William F., Carleton Place, Ontario, Canada; plant superintendent, Findlays, Ltd.

Fraser, Walter A., Bausch & Lomb Optical Co., Glass Plant, Rochester, N. Y.; research physicist.

*Fraulini, Felix M., Charles Taylor Sons Co., Taylor, Ky.; ceramic engineer.

Grim, Ralph E., Illinois Geological Survey, Urbana, Ill.; petrographer.

*Howe, Wallace L., Technical Dept., Norton Co., Worcester, Mass.

Humphrys, James M., Dept. of Ceramics, Rutgers Univ., New Brunswick, N. J.

Hurst, Lon R., 1743 First Ave., South, Seattle, Wash.; manager, L. R. Hurst & Co.

King, Maxon H., Box 368, East Liverpool, Ohio; mechanical engineer, Edwin M. Knowles China Co.

Lee, Leslie, 66, Leamington St., Sheffield, 10, England; works chemist, Hepworth Iron Co., Ltd.

*Martin, Wesley G., 6054 N. Kent Ave., Milwaukee, Wis.; staff engineer, A. O. Smith Corp.

Miller, Ethel M., 2217 Federal St. Ext., N. S. Pittsburgh, Pa.; teacher, Watt School.

Pfleger, George E., R.F.D. 2, Fairview Rd., Chagrin Falls, Ohio; Harshaw Chemical Co.

Rogers, Carroll P., Jr., Burnsville, N. C.; general manager, Feldspar Milling Co.

Scholes, Addison B., 5 S. Main St., Alfred, N. Y.; technical representative, National Lead Co.

Shonfeld, Theodore H., 19 Probasco St., Lawrenceburg, Ind.; chemical engineer, Joseph E. Seagram & Sons.

Shook, Louise, Ellisville, Miss.; Jones County Agricultural High School and Junior College.

Smith, Richard V., 11 Lietch Ave., Skaneateles, N. Y.; plant superintendent, N.Y.A. Pottery.

Van Name, Roland L., Technical Laboratories, Sears, Roebuck & Co., Chicago, Ill.; chief chemist.

Vincent, George L., 56 Jefferson Ave., Rockville Center, N. Y.; ceramic engineer.

Watters, Clarence S., 218 Medical Arts Bldg., Hamilton, Ontario, Canada; dentist, Akme-Steel Dental Supply Co.

Wysong, Charles F., Georgia School of Technology, Ceramic Engineering Dept., Atlanta, Ga.; professor.

Student

University of Illinois: Lewis K. Breeze, Adolph B. Cosby, Howard R. Swift, Vernon W. Lenz, and Howard F. West.

Missouri School of Mines: K. E. Krill.

New York State College of Ceramics: Robert L. Brownell, W. S. Cole, Jr., Wesley E. Curtis, Walter R. Dlugozima, Lewis Kluth, Lawson E. Mason, Frank P. Maxwell, Alden J. Smith, Grant E. Tucker, Joseph L. Utter, George V. Ward, and James F. Wygant.

Ohio State University: James H. Jacobi and William H. Linkhorn.

Pennsylvania State College: Alfred J. Posteraro.

University of Saskatchewan: J. F. Nicks.

Virginia Polytechnic Institute: Charles W. H. Barnett, C. E. Butler, Jr., T. T. Land, and Joseph Stern.

University of Washington: Roy E. Swift.

* Indicates former member of The Society rejoining.

MEMBERSHIP WORKERS' RECORD

Corporation

H. C. Kleymeyer	1
W. A. Weldon	1
Office	5

Personal

C. R. Austin	1	R. H. Randall	1
J. F. Booth	1	V. J. Roehm	1
Ian Campbell	1	K. A. Rugh	1
R. M. Campbell	1	G. A. Schroter	1
W. M. Cohn	1	M. R. Scott	1
J. W. Iliff	1	Harry Thiemecke	1
R. N. Long	1	J. P. Thorley	1
Lane Mitchell	1	F. J. Williams	1
Rexford Newcomb	1	Carl Zwermann	1
C. M. Nicholson	1	Office	10

Student

A. I. Andrews	7	W. D. Packman	2
R. M. Campbell	10	J. W. Whittemore	4
E. C. Henry	1	W. G. Worcester	1
P. G. Herold	1	Carl Zwermann	1
		Grand Total	**63**

ROSTER CHANGES DURING MARCH AND APRIL*

Corporation

Porcelain Products, Inc., John G. Loy (voter), Box 300, Findlay, Ohio (Parkersburg, W. Va.)

Personal

Alexander, Edgar K., Box 374, Magnolia, Ark. (Atlanta, Ga.)

Baker, Julius, 563 Stanley Ave., Columbus, Ohio (Dayton, Ohio)

Baldwin, William J., Humphryes Mfg. Co., Mansfield, Ohio (Pittsburgh, Pa.)

Bauer, Wolf G., Washington Brick & Lime Co., Spokane, Wash. (Roche Harbor, Wash.)

Bowman, John G., Box 7, Schellsburg, Bedford County, Pa. (Pittsburgh, Pa.)

Buck, Ivan, Jr., 420 Broad St., Emporium, Pa. (Niagara Falls, N. Y.)

Cordes, John E., 4455 N. Oakland Ave., Shorewood, Wis. (Milwaukee, Wis.)

* Address in parentheses is former address.

DAMMANN, ARTHUR, Brockway Clay Co., Brockway, Pa. (Chicago, Ill.)
DAVIES, CHESTER A., Yardley River Rd., Yardley, Pa. (Trenton, N. J.)
DIPPELL, LAWRENCE V., 34 Anderson Place, Hamburg, N. Y. (Philadelphia, Pa.)
DRAKE, ARTHUR D., New Castle Hot Top Co., New Castle, Pa. (New Galilee, Pa.)
FELTER, WARREN B., JR., 436 Larch Ave., Bogota, N. J. (Cleveland, Ohio)
FORD, WILLIAM D., 8 Moross Ave., Mt. Clemens, Mich. (La Grange, Ill.)
GASKINS, WARDEN W., 327 W. Garfield St., Glendale, Calif. (Rockford, Ill.)
GRAHAM, ROBERT P., Johns-Manville Co., Lompoc, Calif. (Seattle, Wash.)
HITE, EARL E., 410 South 3rd St., Toronto, Ohio (Pleasantville, Ohio)
HURDMAN, WILLIAM L., 7 High St., Pensnett, Dudley, Worcestershire, England (Argentina, S. A.)
HUTT, GLENN A., Ferro Enamel Corp., 4150 East 56th St., Cleveland, Ohio (Alexandria, N.S.W., Australia)
KREIDL, EKKEHARD, Kreidl Chemico-Physical Corp., 5201 Denison Ave., Cleveland, Ohio (Dunkirk, N. Y.)
KREIDL, IGNAZ, Kreidl Chemico-Physical Corp., 5201 Denison Ave., Cleveland, Ohio (Dunkirk, N. Y.)
KREIDL, WERNER, Kreidl Chemico-Physical Corp., 5201 Denison Ave., Cleveland, Ohio (London, S.W.1, England)
LAMBE, C. MILTON, 307 O'Connor St., Ford City, Pa. (Kittanning, Pa.)
LANGE, LOUIS A., 505 Maple St., East Liverpool, Ohio (Oak Park, Ill.)
MAUPIN, ADDISON, General Refractories Co., 828 Milledge Rd., Augusta, Ga. (Savannah, Ga.)
MODIGLIANI, PIERO, Light Conditioning Co. of America, Inc., 6 East 45th St., New York, N. Y. (Leghorn, Italy)
MONCRIEFF, J. W., Box 491, Santa Monica, Calif. (Crooksville, Ohio)
ROGERS, GREGORY L., 2901 Los Feliz Blvd., Los Angeles, Calif. (Seattle, Wash.)
ROSS, DONALD W., 121 Peeke Ave., Kirkwood, Mo. (St. Louis, Mo.)
RUSSELL, RALSTON, JR., Research Labs., Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. (Columbus, Ohio)
SIEGRIST, PAUL F., 7338 Arlington Drive, Richmond Heights, Mo. (St. Louis, Mo.)
SPEIL, SIDNEY, Norris, Tenn. (Boston, Mass.)
SUMRELL, FERRALL N., 223 Henry St., East Hempstead, N. Y. (Hollis, N. Y.)
SWENTZEL, JOHN P., 2725 Weston Ave., Niagara Falls, N. Y. (Lewiston, N. Y.)
WHITTINGTON, LLOYD R., Box 122, Fredericksburg, Ohio (Columbus, Ohio)
WILLIAMS, ARTHUR E., 254 S. Burrowes St., State College, Pa. (Dubuque, Iowa)
WILLIS, JAMES B., 2905 N. Charles St., Baltimore, Md (Columbus, Ohio)
ZINSZER, WILLIAM K., Ames Pottery Co., Ames, Iowa (Des Plaines, Ill.)

FELLOWS OF THE AMERICAN CERAMIC SOCIETY ELECTED IN 1939–1940

BRUNER MOORE BURCHFIEL, Gladding, McBean, & Co., Los Angeles, Calif.
GRANT SIDNEY DIAMOND, Electro Refractories & Alloys Corp., Lackawanna, N. Y.
ELMO HENRY LINTZ, Taylor, Smith, & Taylor Pottery Co., Chester, W. Va.
JAMES ROBERT BEAM, Universal Sanitary Mfg. Co., New Castle, Pa.
NELSON WOODSWORTH TAYLOR, Pennsylvania State College, State College, Pa.
ROBERT REX SHIVELY, B. F. Drakenfeld & Co., Washington, Pa.
JOHN EARL FRAZIER, Frazier-Simplex, Inc., Washington, Pa.
JAMES BLISS AUSTIN, Research Lab., U. S. Steel Corp., Kearny, N. J.
JOHN TRECARTIN OGDEN, *Glass Industry*, New York, N. Y.

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MANUFACTURERS
PINS COLUMBUS, OHIO STILTS

A PROPHECY COME TRUE
YOUR STRENGH IS INCREASING

1940 PAID MEMBERSHIP RECORD

Date	Members paid		Deferred	Subscriptions	Monthly sales	Total circulation
	Personal	Corporation				
January 22, 1940	1930	244	23	656	220	3073
February 20, 1940	1972	243	30	669	220	3134
April 17, 1940	1732	243	30	522	220	2747
Foreign unpaid 1940 but held on mailing list	82	4		150		236
April 17, 1940 (total)	*1814*	*247*	*30*	*672*	*220*	*2983*
April 18, 1938	1635	205	60	527	220	2647
April 18, 1939	1641	226	58	596	220	2741

■ This chart shows only the "paid" members.

■ Fifty-one (51) Personal and seven (7) Corporation members have joined and paid their dues since the February 20 report. In addition, five (5) persons have joined but have not paid.

■ But the sad part of the record, not revealed in the chart, is that on April 1 the mailing list suffered a loss of 149 Personal and 6 Corporations owing to nonpayment of dues.

■ The net, in spite of these delinquents, is a gain in strength.

■ Letting you in on a secret (by a note written on May 6).
Twenty-nine (29) Personal and one (1) Corporation have paid, leaving our count of unpaid members 120 Personal and 5 Corporations, our usual annual turnover.

CERAMIC CAMERA CLUB

The Chauncey E. Frazier Award of Merit of The American Ceramic Society was presented in absentia to G. Bickley Remmey of The R. C. Remmey Son Company of Philadelphia at the annual dinner meeting of the Ceramic Camera Club in the Royal York Hotel in Toronto, on Wednesday evening, April 10, 1940.

CAMERA CLUB WINNERS OF AWARDS

Award	Classifications	Exhibitor	Picture Title
First	Pictorial	Rolland Roup, Pittsburgh	Deserted
Honorable Mention	"	G. Bickley Remmey, Philadelphia	Pussy Willow
First	Action	J. Earl Frazier, Washington, Pa.	W. & J. Waynesburg College Basketball Game
Honorable Mention	"	Rolland Roup, Pittsburgh	Skyward
First	Portrait	Roy W. Wampler, Toledo	Yum Yum
Honorable Mention	"	John M. McKinley, Cleveland	Yas Suh! This Was the Senator's Hat
First	Trade paper	Robert C. Knauft, Cincinnati	Decline of the West
First	Industrial	Lewis M. Austin, Salem, N. J.	Sparks
Honorable Mention	"	J. Earl Frazier, Washington, Pa.	Rhythm in Industry
First	Scientific	E. L. Hettinger, Reading, Pa.	Science—Polarized
Honorable Mention	"	E. L. Hettinger, Reading, Pa.	Double Refraction Polarized

E. L. Hettinger, director of research of Willson Products, Inc., introduced Ross C. Purdy, General Secretary of The Society, as toastmaster. Dr. Purdy introduced Joseph P. Thorley, head of the Department of Ceramics and Art of the University of Pittsburgh, who made the formal presentation.

J. P. Thorley Makes Presentation

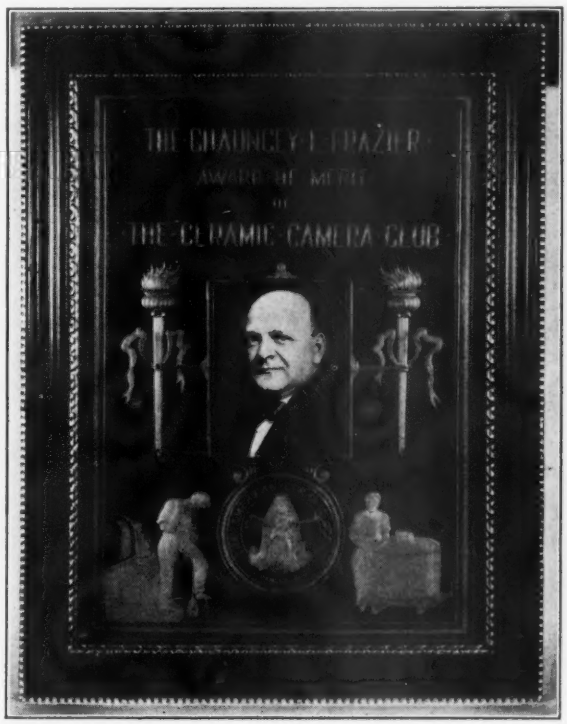
Professor Thorley in his presentation said, "The quality of the photographic art exhibited at this Second Annual Salon of the Ceramic Camera Club is so excellent that the task of selecting the most outstanding photograph by the Jury of Award was very difficult. Mr. Remmey's photograph titled 'Pussy Willow' and entered in the pictorial classification has won the unanimous approval of the judges, Francis C. Flint, Hazel-Atlas Glass Company; Charles D. Spencer, General Electric Company; and myself. I express the wishes of the Jury of Award that in future years there be a greater number of photographs exhibited showing industrial and scientific studies of ceramics and glass, which also is the hope of the donors of the Chauncey E. Frazier Award.

"I extol some of the international achievements of Mr. Frazier, in glass plant engineering and as professional engineer and Fellow of The American Ceramic Society; also of my pleasure in knowing that Mr. Frazier has recently been honored by the Society of Glass Technology of England in the raising of him to the rank of 'Fellow.' I am familiar with the excellent work and it is my pleasure to know the artist and craftsman, Frederick Carder, Art Director of the Steuben Division of the Corning Glass Works, who has designed and made this beautifully engraved Steuben glass trophy. I know many of my friends and acquaintances would willingly relinquish other aesthetic honors and plaques for the privilege of winning something created by Frederick Carder. It is a very great pleasure to bestow this beautiful award to Mr. Remmey for his fine contribution."

Dr. Purdy next presented Randolph Macdonald, immediate Past-President of the Toronto Camera Club, who is an Associate of the Royal Photographic Society of England. Mr. Macdonald was one of the committee of three Toronto photographic craftsmen who judged the Ceramic Camera Club's Second Annual Salon and awarded the classification ribbons. The other members of this committee were W. H. Hammond and Stanley Harrod, the latter a Fellow of the Royal Photographic Society of England.

In his talk, Mr. Macdonald also praised the quality of the Salon and offered congratulations. He expressed pleasure in having been able, through the Toronto Camera Club, to sponsor the exhibit. He criticized and told how to improve a dozen prints of pictorial and portrait classifications that were hung in the Salon. He expressed the hope that members of the Ceramic Camera Club would exhibit prints in the Toronto Salon this year.

Dr. Purdy next introduced W. H. Hammond of Toronto



G. B. Remmey, first winner of Frazier Camera Club Award of Merit

Frederick Carder of Corning; and Gordon C. Keith, General Secretary of the Canadian Ceramic Society.

A business meeting followed the program.

Board of Governors

The Board of Governors of the Ceramic Camera Club is composed of *Chairman*, John M. McKinley, Cleveland, Ohio; E. L. Hettinger, Reading, Pa.; John R. Hostetter, New York, N. Y.; Irwin R. Schoeninger, Milwaukee, Wis.; and *Secretary-Treasurer*, J. Earl Frazier, Washington, Pa.

Members of The American Ceramic Society are cordially invited to join the Ceramic Camera Club.

A. DE A. PEREIRA NOMINATED FOR PRESIDENCY OF ROTARY INTERNATIONAL

Armando de Arruda Pereira of São Paulo, Brazil, has been nominated for the presidency of Rotary International. Inasmuch as there is no opposing candidate, his nomination is tantamount to his election. Mr. Pereira has been a member of The American Ceramic Society since 1938 and has been active in securing other South Americans as members. The following biographical sketch is presented.

Born September 28, 1889, in São Paulo, Brazil, S. A. Attended grammar school in his home city and in Genoa, Italy; returned to São Paulo, took course in a high school (Nogueira da Gama School).

In 1905 entered the Polytechnic College (Escola Polytechnica) of São Paulo but a short time later went to England where he resumed his studies in the Seafield Park Engineering College, in Fareham Hants. In 1907, he joined the Civil Engineering Courses of the University of Birmingham (England) and then went to New York University, where he received his civil engineering diploma in 1910.

Mr. Pereira is married and has a son and two daughters.

He has already written several books and essays on his own profession as well as on Rotarian subjects, history, and travels.

Speaks Portuguese, English, French, Spanish, and Italian.

Armando de A. Pereira

Professional Record

1911–12 Engineer, in São Roque, with the firm Valle Rodrigues & Ramos, of São Paulo.
1912–14 Superintendent of the Lilyland Lime Works, in Sorocaba.
1915–16 Partner in the firm Ralston, Pereira & Delpy, civil engineers with offices in São Paulo.
1917 Acted as Engineer of the Companhia Constructora de Santos, during the construction of the slaughter-house and freezing plant in Santos.
1917–20 Engineer Manager of the Cia. Frigorifica de Santos.
1920–21 Manager of the Companhia Frigorifica e Pastoril, in Barretos, whose freezing plant he rebuilt. Managing Director of the same Company.
1922 Delegate of the American Society of Civil Engineers at the Engineering Congress held in Rio de Janeiro on the occasion of the first centennial of Brazilian Independence.
1921–24 Chief Engineer and Inspector of the Companhia Constructora de Santos while this Company was building military barracks for the Brazilian army in the states of São Paulo, Minas Geraes, Paraná, Santa Catharina, and Matto Grosso. In the latter State, the building work executed under the supervision of Mr. Pereira amounted to one million dollars, approximately.
1923 to date—Director and Engineer of the Ceramica S. Caetano S/A.

Rotarian Record

Entered the Rotary Club of S. Paulo in 1931.
Classification: Ceramic industry; refractory materials; manufacturing.
Club Secretary 1932–1934.
Club President 1934–1935.
Governor 72nd district (Brazil) 1935–1936.
Member of Magazine Committee of Rotary International 1937–1938.
2nd Vice-President of Rotary International 1937–1938.
Representative of Rotary International in the Conference of the 72nd District, in Bahia, 1937.
Representative of Rotary International in the Conference of the 72nd District, in Porto Alegre, 1938.
Attended the Conferences of 72nd District in Santos, Recife, Rio de Janeiro, Bahia, and Porto Alegre.
Attended the International Conventions held in Mexico City, Nice, and San Francisco.
Attended the first South American Regional Conference in Valparaizo.
Visited a large number of Clubs in Brazil, Uruguay, Paraguay, Argentine, Chile, Mexico, United States, France, England, Italy, Germany, and Switzerland.

Community Record

Director of the Federação das Industrias (Association of Industries of the State of São Paulo).
Fellow, Royal Society of Arts of London.
Member, American Society of Civil Engineers.
Member, The American Ceramic Society.
Member, Historical and Geographical Institute of S. Paulo.
Member, Consulting Council of the Associação Commercial (Chamber of Commerce) of S. Paulo.
Member, Instituto de Engenharia de S. Paulo.
President, Employers Syndicate for the Ceramic Industry of Building Materials.
Delegate, Brazil-Argentine Chamber of Commerce.
Past Vice-President, Federação das Industrias of the State of S. Paulo.
Past Director-Secretary, Associação Commercial of S. Paulo.
Past Member, town council of S. Bernardo.
Past Director, Instituto de Engenharia de S. Paulo.

GROW BY GETTING MORE NEW MEMBERS TO JOIN THE SOCIETY

CERAMIC EXHIBIT OF E. P. POSTE

Emerson P. Poste, of Chattanooga, Tenn., on March 9, 1940, presented to the ceramic students of the University of Alabama their Charter for the Student Branch. Mr. Poste, in a letter to the Secretary, describes his ceramic exhibit which he showed at this meeting.

"Following the dinner, I gave my lecture on the ceramic industries, based on an exhibit which has been growing 'Topsy' fashion for many years. I have used this any number of times locally, and last fall I made a tour with it, appearing before ten Sections of the American Chemical Society in the southeastern states. I am to take it to St. Louis the first of April and have a tentative agreement with the Chemical Society to make another tour next fall. The picture was taken as the exhibit was set up for a lecture at the University of Chattanooga, in connection with a class in industrial chemistry which I am teaching in night school. One of the biggest kicks that I get out of the display is the fact that practically every piece in the exhibit was presented to me by some friend in The American Ceramic Society and reminds me of him whenever I look at it."

Ceramic exhibit owned by Emerson P. Poste on display at the University of Chattanooga

LOCAL SECTIONS

BALTIMORE-WASHINGTON SECTION

The mid-winter meeting of the Baltimore-Washington Section was held at Tilden Gardens on March 2. Dinner was served at 6:30 P.M.

Following the dinner, members went to the main lecture hall at the National Bureau of Standards where a sound movie, "Steel, Man's Servant," was shown through the courtesy of the United States Steel Corporation. This movie presents in full technicolor the story of steel, from the winning of the ore to the finished product. It is accompanied by a special musical score composed by Robert Armbruster, and the story is told by Edwin C. Hill.

Twenty-nine members attended the dinner, and forty additional guests joined them at the Bureau meeting.

—KENNETH M. SMITH, *Secretary*

PACIFIC NORTHWEST CLAYWORKERS ASSOCIATION

The annual meeting of the Pacific Northwest Clayworkers Association was held on March 9 in the Mines Laboratory, University of Washington, Seattle, Wash. Forty-five members attended the day sessions. The following program of papers was presented:

(1) "Stoneware Manufacture," by A. Hable, Pacific Stoneware Co., Portland, Ore.

(2) "Sanitary Sewerage," by J. E. Bowen, Gladding, McBean, & Co., Seattle, Wash.

(3) "Competitive Partition Walls," by H. Kreitzer, Columbia Brick Co., Portland, Ore.

(4) "Cooperation Between the University and Industry," by C. H. Zwermann, Dept. of Ceramic Engineering, Univ. of Washington, Seattle, Wash.

(5) "Comparison of the Effectiveness of Header Courses and Metal Ties in Brick Walls," by A. L. Miller, Univ. of Washington, Seattle, Wash.

(6) "Reinforced Brick Walls," by F. G. Burrows, Chehalis Brick & Tile Co., Chehalis, Wash.

(7) "Gladding, McBean, & Company Suspended Arches and Walls," by W. E. Clark, Gladding, McBean, & Co., Seattle, Wash.

(8) "Electric Firing of Heavy Clay Products" (read at meeting); written by Hewitt Wilson, Electrotechnical Lab., Bureau of Mines, Norris, Tenn.

A committee consisting of a member from each of several brick plants was appointed to consider the feasibility of running tests on different types of reinforced-brick walls.

Another committee consisting of A. Hable, Pacific Stoneware Co., Portland, Ore.; Howard Mansur, Gladding, McBean, & Co., Renton, Wash.; Frank Houlahan, Builders Brick Co.; and Neal Fosseen, Washington Brick and Lime Co., was appointed to make plans for a graduate fellowship in Ceramic Engineering at the University of Washington on problems of interest to the Association.

The officers elected at this meeting for 1940–1941 are as follows: *President:* James Hadgkiss, Port Haney Brick Co., Ltd., Haney, B. C. *Secretary:* C. H. Zwermann, Dept. of Ceramic Engineering, Univ. of Washington, Seattle, Wash.

Vancouver, B. C., was selected tentatively as the site for the summer meeting.

Sixty-five persons attended the evening dinner at the Meany Hotel. Fremont Burrows presided as toastmaster, and W. E. Priestley delivered the main address.

—CARL H. ZWERMANN, *Secretary*

CHICAGO SECTION

On March 9, sixty-eight members and guests of the Chicago Section of The American Ceramic Society met at

the Graemere Hotel for dinner, and about eighty people attended the meeting following the dinner. The attendance included a delegation of sixteen students from the University, who had been in Chicago during the day for trips to ceramic plants.

Papers were presented as follows:

(1) "Pottery Plasters," by Charles I. Gerber, U. S. Gypsum Company.

(2) "Recent Developments in Glazes," by C. W. Parmelee, Head, Department of Ceramic Engineering, University of Illinois.

Discussing a number of factors relating to commercial mold production, Mr. Gerber emphasized the importance of careful control of the water-plaster ratio. Extensive experimentation in plaster mixing showed that the mixer should operate between 300 and 400 r.p.m. and should use a 3-blade propeller with a 20- to 30-degree blade pitch. The best mixing vessel was one with the height equal to the top diameter and the bottom equal to four-fifths of the top diameter.

Professor Parmelee outlined the recent work done by enamelers in investigating their grinding problems and control of viscosity of slips. These data could be translated almost directly to glaze practice with gratifying results. He also pointed out that glazemakers would do well to learn more about the particle size of their materials than they know today.

The Chicago Section anticipates an annual golf tournament in June and is now laying plans for a symposium on service refractories to be held in the fall, probably in October.

—Rexford Newcomb, Jr., *Secretary*

NORTHERN CALIFORNIA SECTION

In spite of a steady downpour all day on Saturday, March 30, the Ceramic Society outing went according to schedule, with visits to the M. & S. Tile Company, Kraftile Company, and California Pottery Company. Barbecued steaks, spaghetti, salad, and wine were then enjoyed in the historic Old Adobe before an open fire.

John T. Roberts, Stockton Fire Brick Company, San Francisco, Calif.

Chuck Kraft, Chairman of the Northern California Section and President of Kraftile Company, acted as master of ceremonies. George Smith, President of the M. & S. Tile Company, led in group singing.

Presented to the capacity gathering in the Old Adobe were George C. Roeding, Jr., President of the California Nursery, and Mrs. Roeding. Present also were Graham G. Smith, Treasurer of the Northern California Section; E. E. Saunders, Vice-President of Gladding, McBean, & Co.; and George Sladek, Superintendent, J. B. Crawford, Vice-President, and J. B. Lewis, Assistant Secretary-Treasurer, all of Kraftile Company.

—C. W. Kraft, *Chairman*

George A. Page, Stockton Fire Brick Co., Pittsburg, Calif., Secretary of the Northern California Local Section

CERAMIC OPERATIVES' INSTITUTE AT OHIO STATE UNIVERSITY

The Ceramic Operatives' Institute will be held May 14 to 16 in Lord Hall, Ohio State University. The Institute will be conducted by the Department of Ceramic Engineering.

The theme of the Institute will be "The Application of Material and Process Controls to Plant Production." There will be prepared lectures, followed by open discussions, for the Structural Clay Products, Refractories, and Whiteware divisions of the Ohio Ceramic Industries Association. The discussions in the classroom will be followed by demonstrations in the laboratory.

There will be a registration fee of $3.00 to defray the cost of the Institute, including a dinner on Wednesday night, May 15, for each man attending.

Southern California Local Section. Dinner Meeting Group, February 20, 1940, at the Clark Hotel, Los Angeles, Calif.

CERAMIC SCHOOL NOTES

UNIVERSITY OF WASHINGTON

Seven ceramic students of the College of Mines, University of Washington, on March 16 went on a field trip under the guidance of Carl H. Zwermann and Wendell P. Keith. They visited Portland, Ore., and Lincoln, Stockton, Niles, Oakland, and San Francisco in California. The purpose of the trip was to acquaint the student with the firing and glazing processes used by southern firms. The students making the trip were Kenneth Breen, Edward Carter, Ben Davies, James McKinnell, Vernon Moss, Jack Pittman, and Harry Luther.

If an observer at the University of Washington should perceive an enlightened appearance on the faces of the ceramic engineering students, it will no doubt be due to the numerous educational activities in which they have participated on this trip. This group had the good fortune to visit fifteen different manufacturing plants and one testing laboratory at which some unique experiments concerning stress and strains in steel and clay bodies were explained. The outstanding products of the ceramic industry, which we had the privilege of seeing made, were brick, tile, pottery, terra cotta, dinnerware, sanitary ware, stoneware, metal enameling, glassware, and electrical porcelain. We also had the good fortune to see steel in the process of manufacture, which proved highly colorful as well as educational.

After a week of real fun plus many new ideas tucked away, our embryo engineers headed for home. It had proved a worth-while spring vacation for all.

Immediately upon returning home, plans were formulated for the participation of the Ceramic Engineering Department in the Engineers' Open House at the University of Washington. This bi-annual exhibit was held on Friday and Saturday, March 29 and 30, which afforded each school of engineering an opportunity to display its worth-while contributions of the past year. Outstanding displays featured by the ceramic students were pottery throwing and casting, jiggering, metal enameling, tile extrusion, thermal conductivity of various refractory brick plus exhibits of all types of art pottery, glassware, dinnerware, and products made from diatomaceous earth. An interesting experiment was conducted by one of the students to test the chipping, impact, and porosity qualities of hotel chinaware, which proved highly interesting to the visiting crowds.

Student Appreciation

In conclusion, we should like to express our appreciation for the cordiality and cooperation which we were so fortunate to receive on our field trip to various manufacturing establishments along the coast. It was indeed a pleasure to have such a fine inside look into modern industry.

—JIM MCKINNELL, *Student Secretary*

RUTGERS UNIVERSITY

The Rutgers Ceramics Club and Student Branch of The American Ceramic Society met on March 13 at the Ceramics Building, Rutgers University, New Brunswick, N J.

Campbell Robertson, of E. I. du Pont de Nemours and Co., Perth Amboy, N. J., spoke on "Ceramic Colors." Dr. Robertson, who has had wide experience in the investigation and production of coloring methods for all types of ceramic products, gave a complete survey of the color question, including the methods available, the coloring agents, and their production and methods of use.

The lecture was followed by a brief discussion.

—GILBERT GOODMAN, *Corresponding Secretary*

NEW YORK STATE COLLEGE OF CERAMICS

Grant Diamond of the Electro Refractories & Alloys Corp., Lackawanna, N. Y., spoke at the regular meeting of the New York State College Student Branch on February 13, 1940. His topic was "Refractories Manufacturing and Some Applications in the Ceramic Industries." The talk was illustrated with movies and slides.

Approximately one hundred student members and faculty members attended the meeting.

A. J. Haecker, Jr., was elected Corresponding Secretary in charge of publicity.

UNIVERSITY OF ALABAMA

Installation of Student Branch

The Alabama Student Branch of The American Ceramic Society was installed on March 9, 1940. During the afternoon, guests were welcomed and small informal parties were conducted through the ceramic and chemistry laboratories. The formal installation began with a banquet in the evening at the McLester Hotel with sixty faculty members, men from industry, and students present.

As a result of the interest in the installation, the following persons were present: Richard C. Foster, President of the University; S. J. Lloyd, Dean of the School of Chemistry, Metallurgy, and Ceramics; G. J. Davis, Dean of the School of Engineering; E. P. Poste, Past-President of The American Ceramic Society and installing officer; E. Barrows, assistant to Mr. Poste; J. H. Newman, Dean of Men; W. Coghill, principal ore dressing engineer, U. S. Bureau of Mines; T. N. McVay, Professor of Ceramics; George Palmer and A. M. Kennedy of the School of Chemistry, Metallurgy, and Ceramics. Others present were G. T. Faust, R. G. O'Meara, John Hazel, and R. W. Smith of the U. S. Bureau of Mines.

The ceramic industry in Alabama was represented by G. W. Lewis, *President*, Jack Lewis, and L. S. Rodgers of the Dixie Firebrick Co.; S. B. West of Refractory Sales, Inc.; O. Morrow and S. Catlett of Harbison-Walker Refractories Co.; Robert White and Arthur Watkins of Alabama Clay Products Co.; Girard Murray, refractory engineer of the Tennessee Coal and Iron and Railroad Co.; and Richard Palmer of the Stephenson Brick Co.

Lane Mitchell, Professor of Ceramics at the Georgia School of Technology, and six members of the Georgia Tech Student Branch were guests. Other guests were the presidents of the kindred student organizations on the campus. Among these were R. E. Morris, A.C.S.E.; William Allman, A.I.M.E.; O. M. Rockwell, S.A.E.; Roger Kase, S.A.M.E.; George White, A.I.Ch.E.; and E. A. Keyhoe, A.I.E.E.

Officers and Charter Members of Student Branch

Host to these guests were the members of the newly formed Alabama Student Branch, which included T. N. McVay, Faculty Advisor; Edward Forst, Jr., President; Stanley G. Kalemaris, Vice-President; Ralph V. Wakefield, Secretary; and Earl A. McCoy, Treasurer. The other Charter Members were Howard Crammer, V. Wesley Weidman, Louis S. Kornicker, Jerome P. Newmark, Joseph W. Kelley, Fred A. House, Joseph A. Yancis, Lawrence W. Murray, Tom C. Garepis, Wendell W. Wyman, Edgar C. Gill, Robert B. Carroll, George J. Kucera, Fred J. Fitch, John W. Lewis, Jr., Howard L. Ritter, Jr., and Ira Stark.

The welcoming address was given by the president, Edward Forst. Following the address, the members surprised Dr. "Mac" by presenting him with a Kaywoodie "Flame Grain" pipe as a token of their appreciation. Taking charge of the banquet, Dr. McVay introduced his friend, Emerson Poste. Mr. Poste extended his congratulations, and the congratulations of Ross C. Purdy, General Secretary of The American Ceramic Society. The banquet was brought to a close by the formal presentation of the charter.

Following the banquet, the group returned to the campus to hear the lecture, "Ceramic Industries," by Mr. Poste.

At this time the members wish to extend their most sincere thanks to Mr. Poste and to the officers of The American Ceramic Society who made this occasion possible.

The Secretary of The Society Writes to Alabama Students

"I can clearly visualize the meeting which you have convened. I have a vivid picture of Tuscaloosa and University City, the Campus, the ceramic laboratories, the Bureau of Mines, and the several ceramic men on the campus and in nearby industries, as well as the reception given mother and me at the hotel and the meeting on the campus two or three years ago.

"I regret that I cannot be with you today to repeat those very happy experiences. You are enjoying not only the presence of an official representative of The American Ceramic Society, Emerson P. Poste, but also a valued privilege. You have an obligation to yourselves and to your parents in return for the investments which are being made in training you for service in the ceramic industry. You also have an opportunity to extend your intellectual development beyond that which you receive in the classroom and laboratories under the tutelage of your instructors and beyond the years that you are at Tuscaloosa. An education fails if it is not broadened and deepened by consistent studying. Education is not completed when you receive a degree at the June Convocation.

"There are men and women in the ceramic industries and in the ceramic schools, the bureaus, and the research institutes who are devoting careful studies to research problems and are spending considerable time in recording them for the benefit of their contemporaries and for posterity. There is no way to calculate the actual money cost of the researches reported in the publications of this Society. There is no way of writing a pen picture of the many hours devoted to the preparation of reports so that you and others interested in ceramics may read and may develop your knowledge. These are actual investments; these are actual gifts; these are valuable aids to enable you to expand in your ability to make contributions to ceramics.

"Membership in The American Ceramic Society not only brings to you these valued research reports, but it also gives you opportunity to contact the many men who are achieving success in their chosen lines and who are big-hearted enough to share their findings with others.

"I congratulate you on this occasion."

—Ross C. Purdy, *General Secretary*

UNIVERSITY OF ILLINOIS NOTES

Wolfram Advanced

H. G. Wolfram, class of 1923, was recently appointed vice-president of Pemco.

Anniversary of Patent Office Founding

A. I. Andrews, Professor of Ceramic Engineering and President of The American Ceramic Society, has been asked to serve on a National Committee to sponsor the Sesqui-Centennial Celebration of the founding of the Patent Office. C. F. Kettering of General Motors is Chairman.

Dr. Andrews' duties will consist of helping to select the twelve outstanding American inventions.

Parmelee's Book on Clays

The book on Clays and Some Other Ceramic Materials by C. W. Parmelee, Head of the Department of Ceramic Engineering, has been selected as one of the books for inclusion in the Crypt of Civilization at Oglethorpe University in Atlanta, Ga.

The Crypt has been prepared under the guidance and advice of some of the greatest scientists of our time and will contain the world's most authentic sources of knowledge contained in books.

The Crypt will be sealed in May, 1940, and will remain inviolate until the year 8113 A.D. when the civilization of that century will have a cross-sectional view of the entire life of our world today.

Keramos at Illinois

The Illinois chapter of Keramos, honorary ceramic engineering fraternity, sponsored a smoker for all of the students in ceramics on March 5. A. K. Bhalla, graduate student from India, who is studying for a Master's degree in enamels, spoke to the group on life and ceramics in Japan where he had spent a year and a half before coming to this country.

The officers of Keramos for this semester are Axel Ottoson, *President;* Justine Boeker, *Vice-President;* Frank Klane, *Secretary-Treasurer;* and Lawrence Puntney, *Herald.*

OHIO STATE UNIVERSITY

The Ohio State University Student Branch met on March 5 at Lord Hall. The meeting was called to order by the president, Howard Petty, and the minutes were read and approved. The following appointments were made for the Ceramic Department Float Committee for Engineers' Day: *Chairman*, Allen Pierce, junior; John Lennon, senior; and James Rickey, sophomore. Charles Tauber, graduate assistant, will plan the departmental exhibits for the same event.

J. Ted McQuaide presented a motion that the Branch appropriate $15.00 to send a representative (Howard Petty) to The American Ceramic Society Annual Meeting in Toronto. The motion was seconded and approved.

O. H. Seegar, of the Southwestern Portland Cement Company, Osborn, Ohio, the guest speaker, discussed the manufacture and uses of Portland cement. Mr. Seegar used a complete and excellent selection of slides to illustrate the various phases of the manufacturing processes and uses of this material. He answered questions at the conclusion of his talk.

April Meeting

The Student Branch of The American Ceramic Society held its regular meeting April 25, 1940, at the Ohio State Archaeological and Historical Museum on the Ohio State University Campus. William D. Overman, Curator of History, presented an informal talk on "Early Pottery of Ohio." Examples of this pottery were on display.

—DONALD E. POSTLEWAITE, *Secretary-Treasurer*

ARMOUR INSTITUTE OF TECHNOLOGY SUMMER INSTITUTE

L. E. Grinter, vice-president and dean of the graduate division, has announced that Armour Institute of Technology, Chicago, Ill., will conduct a three-term Summer Graduate Institute for engineers, professional men, industrialists, and educators in engineering and science beginning with the summer of 1940. Dr. Grinter, who is in charge of the Summer Institute beginning with this year, will invite scientists of great distinction to lecture each summer on modern developments in engineering and science.

This Summer Institute is divided into seven distinct divisions, and the program of specialized classes has been arranged to provide an opportunity for graduate work on the highest possible plane. These divisions include Advanced Mechanics, Chemical Engineering and Chemistry, Civil and Sanitary Engineering, Electrical Engineering and Physics, Mechanical Engineering, Industrial Engineering, and Applied Mathematics.

The first term of the Summer Institute will extend from June 17 to July 13; the second term from July 15 to August 10; and the third term from August 12 to September 7.

MISSOURI MINERAL INDUSTRIES CONFERENCE

The Second Missouri Mineral Industries Conference was held at Rolla, Mo., April 26 and 27, 1940. The following papers were presented at the four sessions:

(1) "Services and Progress of the Missouri Geological Survey, the Mississippi Valley Experiment Station of the U. S. Bureau of Mines, and the Missouri School of Mines During 1939," discussed by H. A. Buehler, W. R. Chedsey, and S. M. Shelton.

(2) "Missouri's Interest in the Mineral Industries," by Carl L. Bolte.

(3) "Missouri Coal: Production, Distribution, and Economics," by A. R. Stock, Sinclair Coal Co.

(4) "Coal and Pyrite: Economic Problems," by Kenneth A. Spencer, Pittsburgh and Midway Coal Mining Co.

(5) "Coal Carbonization: Scientific Knowledge of Coal," by H. A. Curtis, Dean, School of Engineering, Missouri University.

(6) "Efficient Burning of Coal and the Smoke Problem," by T. C. Cheasley, Sinclair Coal Co.

(7) Dinner address, "New Technical Developments and Their Economic Influence," by R. C. Allen, Executive Vice-President, Oglebay, Norton, and Co., and Past-President of A.I.M.E.

(8) "Missouri Oil and Gas Situation," by H. S. McQueen, Missouri Geological Survey.

(9) "Zinc Economics," by Evan Just, Tri-State Zinc & Lead Ore Producers Association.

(10) "Missouri Barite Problems," by A. E. Stocking, De Soto, Mo.

(11) "Missouri Rock Wool," by M. E. Callander, Guardian Rock Wool, Inc.

The officers for this meeting were John Prince, *President*, and W. M. Weigel, *Secretary*. The directors were A. P. Green, John Prince, W. E. McCourt, Roy E. Mayes, Grant Stauffer, Ben D. Reynolds, W. M. Weigel, Evan Just, Victor Rakowsky, A. E. Stocking, H. A. Curtis, Herman Lark, Tolbert Hensen, C. M. Butler, Earl G. Doane, G. C. Smith, E. H. Lewis, and C. W. S. Sammelman.

M.I.T. SUMMER COURSE IN CERAMICS

Ceramic Molding Processes

A special summer program in Ceramics dealing with ceramic molding processes has been announced by the Department of Metallurgy, Massachusetts Institute of Technology, under the direction of F. H. Norton. This course, which will be held from July 8 to 13, is intended to introduce discussions on the various up-to-date methods used in forming clayware. There have been a number of recent developments in this field. Some of these new processes and the equipment used to carry them out will be described. The proposed schedule is as follows:

Monday, July 8: (1) Introduction to Course by F. H. Norton; (2) "Casting Whiteware" by W. Keith McAfee, Universal Sanitary Mfg. Co., New Castle, Pa.; discussion of Mr. McAfee's lecture.

Tuesday, July 9: "Molding Insulating Refractories" by C. L. Norton, Jr., Babcock and Wilcox Co., New York, N. Y.; discussion.

Wednesday, July 10: "Molding Refractory Shapes" by R. S. Bradley, A. P. Green Fire Brick Co., Mexico, Mo.; discussion.

Thursday, July 11: "The Auger Process of Forming" by G. W. Lapp, Lapp Insulator Co., Le Roy, N. Y.; discussion.

Friday, July 12: "The Jiggering Process" by W. H. Emerson, Homer Laughlin China Co., Newell, W. Va.; discussion.

Saturday, July 13: "The Dry Process of Refractories" by G. E. Seil, E. J. Lavino and Co., Norristown, Pa.; discussion.

Each afternoon from 1:00 to 5:00 P.M., laboratory work and informal discussions will be held.

The following experiments will be made available:

(1) The precise measurement of viscosity of clay slips.
(2) Methods of determining the proper deflocculation of casting slips.
(3) Fractionation of a clay in the supercentrifuge.
(4) Measurement of plasticity by the torsion method.
(5) Packing of grog particles to form dense mixtures.
(6) Precise measurement of drying shrinkage.
(7) Dialysis of clays and various measurements for measuring the hydrogen-ion concentration.
(8) Measurement of fine particle sizes.
(9) Thermal analysis as applied to clay minerals.

Tuition and Registration

The tuition fee for this course is $25.00. In addition to the tuition charge, each student registered in the Summer Session is charged one registration fee of $5.00.

As the number admitted to the course must be limited, it is suggested that applications be sent in at an early date.

Living Accommodations

Dormitory accommodations for men are open on the

Institute campus during the summer at $4.00 per week in the Undergraduate Dormitories and $4.00 to $8.00 per week in the Graduate House. Women students may obtain rooms in the lodging houses or the Young Women's Christian Association near the campus. Dining facilities are to be had at Walker Memorial and at the Graduate House, as well as at restaurants and hotels close at hand. Sailing and other sports are available.

SPECIAL SUMMER PROGRAM IN COLLOID CHEMISTRY

The fifth special summer program in "Theoretical and Applied Chemistry and Physics of Matter in the Colloidal State" will be sponsored by the Department of Chemical Engineering, Massachusetts Institute of Technology, Cambridge, Mass.

The course, which will open on June 17 and will last for five weeks, will be under the direction of E. A. Hauser, Associate Professor of Chemical Engineering at M.I.T. The program will consist of lectures, round-table discussions, and practical training in laboratory and research work and is offered to men actively engaged in industry or research and to graduate students.

Additional information on this course may be obtained from the Registrar of the Institute.

NECROLOGY

MARSHALL T. GLEASON

Marshall T. Gleason, vice-president of Gleason-Tiebout Glass Co., Brooklyn, N. Y., died on January 30, after a brief illness. He was forty-nine years old.

Mr. Gleason was a leading figure in the illuminating glassware industry and at one time was president of the Illuminating Glassware Guild, which was later absorbed into a Division of the American Glassware Association of which he was a director.

Always keenly alert to the requirements of the lighting and lamp industry, Mr. Gleason pioneered in the development of a large number of different shapes and textures in glass. He was in charge of distribution for his Company and in close contact with the leading manufacturers in the industry as well as with the illuminating engineers of central stations.

Marshall T. Gleason

Mr. Gleason was successful in helping to raise the standards and improve qualities of glassware for lighting fixtures. He was a member of the tariff committee of the American Glassware Association and was always active in matters pertaining to the advancement and welfare of the industry.

A. M. GREAVES-WALKER

A. McKinley Greaves-Walker, assistant to the chief technical director, of the Libbey-Owens-Ford Glass Co., Rossford, Ohio, lost his life in the railroad disaster of the New York Central Lake Shore Limited, April 19. Mr. Greaves-Walker was thirty-two years of age. He received the Bachelor's degree in ceramic engineering from the University of North Carolina, Raleigh Unit, in 1930, and the following year studied for his Master's degree under a Tau Beta Pi fellowship at Ohio State University. Mr. Greaves-Walker received his Master's degree at the June, 1931, convocation at Ohio State University at the same time that his father, A. F. Greaves-Walker, received his professional degree of ceramic engineer.

In addition to his parents, Professor and Mrs. Greaves-Walker, he is survived by his widow, Adelaide Morgan Greaves-Walker, and a daughter, Cynthia.

Mr. Greaves-Walker became a student member of The Society in 1926 and an active member in 1932. He was also a member of Sigma Xi fraternity.

WALTER J. KOHLER

Walter J. Kohler, chairman of the board of the Kohler Company and a former Republican governor of Wisconsin, died April 21. His death was caused by coronary embolism. He was sixty-five years old.

Mr. Kohler was the son of an Austrian immigrant who founded an enamelware and farm equipment plant. The Company has become one of the leading plumbing manufacturing plants of this country, and the family has established a model village, Kohler, Wisconsin, for its employees.

The Company has been associated with The Society since 1924 and carries a Corporation membership in The Society at the present time.

OTOGORO UMEDA

Word has been received from Japan of the death of Otogoro Umeda of Askashaku, Tokio, Japan. Mr. Umeda became a member of The American Ceramic Society in 1915 and was affiliated with the Refractories Division of The Society.

CHARLES H. PEDDRICK, JR.

C. H. Peddrick, Jr., Vice-President of the United Feldspar & Minerals Corporation and President of the Carolina Pyrophyllite Company, died suddenly on April 4, 1940.

Mr. Peddrick was sixty-nine years old. He was connected with the utilities industry for a number of years and in 1922 became associated as manager with the Gloversville Feldspar Corporation at Gloversville, N. Y. This company later developed into the United States Feldspar Corporation, which, under his leadership, grew into the United Feldspar Corporation (now known as the United Feldspar & Minerals Corporation). When the United Feldspar Corporation was formed, it took over the Tennessee Minerals Products Corporation and later the Oxford Mining & Milling Company. These two companies have now been absorbed by the United Feldspar & Minerals Corporation.

About five years ago, Mr. Peddrick investigated the possibilities of going into the pyrophyllite business, and after a thorough investigation a deposit known as Soapstone Mountain was purchased near Staley, N. C., a plant was erected at Staley, and the Carolina Pyrophyllite Company was formed to handle the mining and grinding of pyrophyllite.

Mr. Peddrick was a strong advocate of chemical control of feldspar and was issued a patent on this process.

He had been a member of The American Ceramic Society since 1923 and was actively interested in the work of the Materials and Equipment Division of The Society.

THE INSTITUTE OF CERAMIC ENGINEERS

MINUTES OF ANNUAL MEETING

Executive Committee

President: H. G. WOLFRAM, Porcelain Enamel & Mfg. Co., Baltimore, Md.
Vice-President: E. H. FRITZ, Westinghouse Electric & Mfg. Co., Derry, Pa.
Secretary: H. M. KRANER, Research Dept., Bethlehem Steel Co., Bethlehem, Pa.
Past-President: J. L. CARRUTHERS, Ohio State Univ., Columbus, Ohio.
Trustee Representative: R. E. BIRCH, Harbison-Walker Refractories Co., Pittsburgh, Pa.

The annual meeting of the Institute of Ceramic Engineers of The American Ceramic Society was held at the Royal York Hotel in Toronto, Canada, on Monday, April 8, 1940, at 4:30 P.M. The meeting was called to order by President J. L. Carruthers. Fifty-nine members were in attendance. The Minutes of the last meeting were read and approved.

The reports of the officers and of the committees were read and approved.

Rules Amendments

A vote was then taken on the proposed amendments to the Rules, as follows:

Article EIR III. Membership

Amend Section (7) (*c*) to read as follows:

The grade of Associate Member may be held by those holding engineering degrees, other than ceramic, provided such degrees have been conferred through departments accredited by the Engineering Council for Professional Development and provided further that they are now, and have been, engaged in a branch of the ceramic industry for a period of at least ten years in work covering practically all phases of the branch. It was moved, seconded, and carried that this amendment be adopted.

Amend Section (8) (*c*) to read as follows:

Those holding an engineering degree, other than ceramic, granted through a department of engineering accredited by the Engineering Council for Professional Development, who are now, and have been, employed in the ceramic industry for a period of ten years or more, who hold a license as a professional engineer, granted by a State or a National Board of Engineering Examiners, and who have rendered outstanding and distinguished engineering service in the ceramic industry.

It was moved, seconded, and carried that this amendment be adopted.

Amend Section (8) (*d*) to read as follows:

Those having ten years or more of active practice in engineering in a branch of the ceramic industry of such an outstanding and distinguished character as to be satisfactory to the Committee on Membership and Examination, whether or not they are possessors of an engineering degree or hold a license as a professional engineer. Note: The terms "practice of engineering" or "engineering work," as used in these rules, shall be defined to include design, engineering, supervising, investigation, control, and teaching.

It was moved, seconded, and carried that this amendment be adopted.

Article EIR IV. Government

Amend Section (1) to read as follows:

The officers of the Institute shall be a President, Vice-President, and Secretary-Treasurer. These officers, together with the Trustee representing the Institute and the most recent Past-President, shall constitute the Executive Committee of the Institute.

Amend Section (2) to read as follows:

A term of office of President, Vice-President, and Secretary-Treasurer shall be one year, etc.

Add Section (7) as follows:

Any member failing to pay an assessment within one year of the date of first notification may be suspended by the Executive Committee until such assessment is paid, and the Executive Committee may drop any member from the membership list whose assessment is in arrears more than one year and six months.

It was moved, seconded, and carried that these amendments be adopted.

Article EIR VI. Officers

Amend Section (3) to read as follows:

The Secretary-Treasurer shall keep Minutes of all Institute and Executive Committee meetings and a full record of the correspondence of the Institute. With the President, he shall duly authorize all payments from the funds of the Institute. He shall perform such other duties as the President may properly assign to him.

The adoption of this amendment was moved, seconded, and carried.

Procedure for Member Applications

It having been unanimously approved by the Executive Committee that the following procedures be used for handling of applications under the above amendments and under the Constitution, they were approved as read.

Applications for Member Grade

(1) All applicants for Member Grade shall submit a regular application form filled out completely to the Chairman of the Membership and Examination Committee.

(2) If the applicant meets the requirements of Sections (8)(*a*) or (8)(*b*) of Article EIR III of the Rules of the Institute, the Chairman of the Membership and Examination Committee will submit said application to his committee for consideration.

(3) If the applicant could qualify only under Section (8)(*c*) or (8)(*d*) of Article EIR III of the Rules of the Institute, then the Chairman of the Membership and Examination Committee shall ask the applicant for further information to permit the Membership and Examination Committee to make a thorough examination of the applicant's record where such information is not given in the original application. The information required shall essentially be as follows:

(*a*) A detailed statement of the applicant's experience in the field of ceramic engineering, giving the names and addresses of all employers and the name of the official under whom the work was done.

(*b*) A detailed statement of the scope of the work in each position held and of the accomplishments in the field of ceramic engineering made therein.

(*c*) A list of the names of at least three persons competent to judge and having full knowledge of the applicant's ability as a ceramic engineer.

The Membership and Examination Committee shall then inquire of each employer and reference as to the applicant's ability and record as a ceramic engineer. Upon receipt of all required statements, the Membership and Examination Committee shall consider the applicant's qualifications and vote to (*a*) deny him Membership of the Institute, (*b*) approve him for Associate Membership, or (*c*) approve him for Member Grade.

If an applicant for Member Grade is refused membership or approved for Associate Grade only, he shall be notified of same and informed that Member Grade may still be attained by either of the following methods:

(*a*) Obtain additional experience in ceramic engineering work with accomplishments therein indicating engineering work of high character and responsibility and make new application at a later date, or

(*b*) Pass a written examination to be given by the Membership and Examination Committee. Such examinations will be given at the time of the Annual Meeting of The American Ceramic Society or at such other times and places as may be designated by the Membership and Examination Committee. All such examinations are to be monitored by the Membership and Examination Committee or by their representatives.

All applications for examinations are to be made at least sixty (60) days before the time of the Annual Meeting.

All data pertaining to examination of record shall be attached to the original application and shall be filed by the Secretary of the Institute in the Institute files, maintained in the office of The American Ceramic Society.

(4) The names of all applicants for Associate and Member Grade shall be published in the Institute page of *The Bulletin of The American Ceramic Society* in the first possible issue after receipt of the application. A suitable note shall call attention of the members of the Institute to said applications and to require them to submit any protests to said applications within thirty (30) days. The Membership and Examination Committee shall not consider any applications until after the protest date has passed.

Note: Since this plan was approved, the next issue of *The Bulletin* should carry a notice to the effect that all Associate Members who originally applied for Member Grade should now apply to Arthur S. Watts, Chairman of the Membership and Examination Committee, for promotion. Their case will then be handled according to the newly approved procedure for the examination of the applicant's record.

Promotion of Junior Members

(1) The Secretary of the Institute shall compile the following data (kept in a special file) regarding each new Junior Member elected to the Institute.

(*a*) Name.

(*b*) The year of graduation from an approved ceramic engineering school. Note: This may be either the date of receiving a bachelor's degree or an advanced degree.

(*c*) The year when the member will normally be eligible for promotion to Associate Membership.

(2) In September of each year, the Secretary shall notify those Junior Members of the Institute who have been out of school for three years (*a*) that they are eligible for advancement to Associate Member if they meet the requirements for that grade as stipulated in Article EIR III, Section (7)(*a*) of the Rules of the Institute, viz., "provided they have been engaged continuously in a branch of the ceramic industry for three years," and (*b*) that if they meet the requirements, they should submit a letter giving (1) a complete time record of their employment in the industry with the names of their employers, (2) the names of the officials to whom they were responsible, and (3) a statement concerning the character and scope of work performed.

(3) The Secretary shall examine all such letters received. If the information contained therein indicates that the Junior Member is clearly entitled to advancement, the Secretary shall then (1) notify the Junior Member of his promotion, (2) file the letter with approval statement thereon with the Junior Member's original application in the Institute files at The American Ceramic Society office, and (3) have the new rating posted on the proper files at The Society's office.

(4) If the Secretary has any doubts regarding the Junior Member's qualifications for advancement, he shall submit the letter to the Membership and Examination Committee for regular consideration.

A resolution was presented by Dr. Greaves-Walker, as follows:

"Resolved that the Institute of Ceramic Engineers is not in favor of the changes in the Model Law proposed by the American Institute of Electrical Engineers, which would exempt from registration all engineers who were not for hire to the public and not in public employment." The adoption of this resolution was moved, seconded, and carried unanimously.

It was moved by R. E. Birch that the Executive Committee consider distribution of the American Engineering Council *Bulletin* to our members. This was seconded and carried.

Induction of New Officers

President, H. G. Wolfram; *Vice-President*, E. H. Fritz; *Secretary-Treasurer*, H. M. Kraner; and *Nominating Committee* (*A*) Hewitt Wilson and (*B*) L. C. Hewitt.

—S. J. McDowell, *Secretary-Treasurer*

INSTITUTE OF CERAMIC ENGINEERS NEW MEMBERS

Associate

Brandt, William O., Gladding, McBean, & Co., Los Angeles, Calif.

Coffeen, William W., Engineering Expt. Station, Ohio State Univ., Columbus, Ohio

Davies, Chester A., American Radiator & Standard Sanitary Corp., Trenton, N. J.

Miller, James L., Johns-Manville Corp., Manville, N. J.

Junior

Foote, Earl H., Jr., Athens Brick & Tile Co., Athens, Texas

Lambe, Claude M., Eljer Company, Ford City, Pa.

Richmond, Joseph, National Bureau of Standards, Washington, D. C.

MEETINGS OF A.S.T.M. IN 1941

The 1941 Spring Meeting and Group Meetings of A.S.T.M. committees will be held in Washington during the week of March 3 to 7, 1941. The Hotel Mayflower has been selected. The Spring Meeting will be held on Wednesday, March 5, of Committee Week.

The Forty-Fourth Annual Meeting is to be held at the Palmer House, Chicago, Ill., during the week beginning June 23 and extending through Friday, June 27, 1941. The Sixth Exhibit of Apparatus and Instruments will be held in conjunction with the meeting.

This will be the third time that an A.S.T.M. annual meeting has been held in Chicago, the previous meetings being in 1931 and 1933.

1940 Annual Meeting

The Forty-Third Annual Meeting of A.S.T.M. will be held June 24 to 28, 1940, at Atlantic City, N. J.

EMERSON P. POSTE

CONSULTING CHEMICAL ENGINEER

ANALYSES: CERAMIC RAW MATERIALS AND PRODUCTS, FUELS, IRON AND STEEL, ETC.

SPECIAL INVESTIGATIONS: PHYSICAL AND CHEMICAL TESTS ON ENAMEL, ETC.

309 McCALLIE AVE.,
CHATTANOOGA, TENN.

NOTES AND NEWS

A.S.T.M. COMMITTEE WEEK

Meetings of one hundred and ten A.S.T.M. committees were held in Detroit, during what has come to be known as A.S.T.M. Committee Week, from March 4 to 8. The total registration for these meetings was four hundred and sixty.

Committee C-8 on Refractories

Committee C-8 on Refractories made a number of recommendations involving specifications and tests in the charge of the committee. One of these involves the specifications for ground fire clay (C105), which are to be revised to provide that on the commercial grade 95% instead of 90% shall pass through a 20-mesh sieve, and the requirements for superduty ground fire clay will be added. Changes in the specifications C49–24, covering lime for silica-brick manufacture, were proposed for submission to Committee C-7 on Lime, the committee in charge of the specifications.

The Specifications for Fireclay Brick for Stationary Boiler Service (C64–39) are to be withdrawn and replaced by two new standards, one covering materials for severe-duty service and the other for moderate-duty service. The Committee also plans to recommend the withdrawal of Specifications for Refractories for Construction of Incinerators (C106–39) and for Fireclay Brick for Malleable Furnaces with Removable Bungs and for Annealing Ovens (C64–39) and to replace them with new specifications which will include a hot-load test as a means of determining refractoriness. This hot-load test is also to be included in the new specifications covering fire-clay brick for severe-duty and moderate-duty boiler service.

During the past year, the Committee has been developing classifications of refractories. New proposals will cover low-heat duty, intermediate-heat duty, and high-heat duty fire clay, and also classification requirements for insulating firebrick.

New definitions of abrasion, corrosion, erosion, and slagging will be published in the Committee report to be presented in June at the A.S.T.M. annual meeting. Three existing tentative items are to be adopted as standard: Revisions in the Method of Panel Test for Resistance to Thermal and Structural Spalling of High Heat-Duty Fireclay Brick (C107–36), and of Super-Duty Fireclay Brick (C122–37), and Tentative Method of Test for True Specific Gravity of Burned Refractory Materials (C135–38T).

The Standard Methods of Chemical Analysis of Refractory Materials (C18–39) cover analytical procedures for a number of refractories, including chrome ores and chrome brick. The latter are to be revised and brought up to date.

The Committee has developed new tentative methods for determining the warpage of firebrick and tile. Work is also being started on an Industrial Survey of Refractories in the Zinc Industry. This will be the ninth in the series that the Committee has issued.

The Committee considered the publication of its Manual on Refractory Materials, which will include, in addition to all of the A.S.T.M. specifications and tests on refractories, the industrial surveys, and it plans to recommend to the Society that this be issued in the fall after the autumn meeting of Committee C-8.

The officers of Committee C-8 on Refractories are *Chairman*, J. D. Sullivan, Battelle Memorial Institute, and *Secretary*, S. M. Phelps, Director of Research and Tests, Refractories Fellowship, Mellon Institute of Industrial Research.

Committee C-16 on Thermal Insulating Materials

Committee C-16 on Thermal Insulating Materials and its subcommittees met on March 7 and 8. This Committee, since its organization in 1938, has been actively working on a program for the formulation of test methods and specifications relating to industrial thermal insulating materials (except those used in the building and insulating refractory fields).

The Committee considered methods for determining the physical properties of preformed insulation and tests for thermal properties (except thermal conductivity) of all forms of insulation. The subcommittee responsible for flexible, blanket, loose-fill, and miscellaneous insulation also held a meeting.

Considerable progress has been made in the preparation of standard physical test methods for various types of insulating materials. The tests under development cover procedures to determine compressive strength, flexural strength, impact resistance, etc. These methods are expected to be ready for final approval by the Committee within the coming year.

The joint committee on the measurement of thermal conductivity, which includes representatives of the American Society of Heating and Ventilating Engineers, American Society of Refrigerating Engineers, National Research Council, and the A.S.T.M., also held a meeting at which its program of work was considered. This joint committee is studying three different types of conductivity test, viz., (1) the guarded hot-plate method, (2) the guarded hot-box method, and (3) the guarded-end cylinder method for testing cylindrical pipe coverings. The test procedure by the guarded hot-plate method is practically completed.

Officers of Committee C-16 on Thermal Insulating Materials are *Chairman*, J. H. Walker, engineer assistant to the general manager, The Detroit Edison Co., and *Secretary*, E. T. Cope, The Detroit Edison Co.

RECOMMENDED REVISION OF SANITARY CAST-IRON ENAMELED WARE

Tests for Acid-Resisting Enamel (Commercial Standard CS77-39)

12 (a) Methods of Test: Acid-resisting enamel shall be subjected either to the lemon test or to the citric-acid test, as specified below, but in cases of dispute the citric-acid test shall be the umpire test. The test for subsurface-acid resistance will be made at the option of the purchasing agency or the inspector.

12 (b) Lemon Test: A freshly cut half of a normally ripe lemon shall be applied to a cleaned area of the enameled ware; after 24 hours at room temperature, the lemon shall be removed and the surface washed with water and wiped dry. No effect on the enamel shall be visible upon careful inspection.

12 (c) Citric-Acid Test (Umpire Test): A fresh test solution made of one part citric-acid crystals to ten parts water by weight shall be applied to the surface of the enamel for 15 minutes, at the end of which period, after washing and drying, no effect of the acid on the treated area shall be visible upon careful inspection. The ware and acid solution shall have been stored for not less than 3 hours immediately preceding the tests in an atmosphere at 80°F. ± 10°F., and the tests shall be made under these conditions of temperature. The test solution shall be applied to clean areas in pools consisting of several drops and covered with a watch glass to hold the solution in place.

12 (d) Test for Subsurface-Acid Resistance of Enamel Coatings on Cast Iron: The test is ordinarily made on a flat or nearly flat specimen 2 inches square cut from the fixture.

(1) Grind off the enamel so as to expose a smooth oblique section of the coating and part of the metal base. Specimens cut from the article may be ground along a cut edge. The oblique section of enamel shall be $^3/_4$ inch $\pm^1/_8$ inch (1.6 to 2.2 cm.) wide. The abrasive used in grinding shall pass a No. 150 sieve and shall be moistened during grinding.

(2) Restore the gloss to the ground enamel surface by refiring just sufficiently to obtain a fire polish. The polished surface shall permit the ready cleaning, with a dry cloth, of marks made by a colored wax pencil.

(3) Apply the citric-acid test, as specified in *12 (c)* to the full width of the fire-polished oblique section. The cut specimens may be immersed in the test solution. After application of the test solution for 15 minutes, the treated surface is washed and dried.

(4) The entire oblique section is rubbed with a colored wax pencil, and the deposit of colored wax is rubbed with a dry cloth. If the wax cannot be readily and evenly removed from all portions of the treated area of enamel by rubbing, thus indicating that the enamel has been roughened by the test solution, the enamel will not be considered acid-resisting throughout.

INTER-SOCIETY COLOR COUNCIL REPORT

Digest of remarks at I.S.C.C. discussion session, Roosevelt Hotel, New York, N. Y., February 22, 1940.

By C. Robertson (American Ceramic Society representative on Council)

Applicability of I.S.C.C. System of Color Names to Opaque Ceramic Products

As several previous speakers have already referred to the present chaotic state of color nomenclature in various fields, especially in written references, I can only add my confirmation that it is fully as true in the ceramic field. It is virtually impossible to base any conclusions or to draw up any program based on statements of color appearances as described in published literature. I feel that the I.S.C.C. system of color names has the potentiality of being a forward step in providing a useful name system, neither too complicated nor too artificially simplified, which may be used, especially in written or published records, to afford a means of describing colors in words with sufficient accuracy for most practical purposes. The chief problem appears to be the question of adequate dissemination or publicity through this field so that those who can use the system to advantage will know about it. This is a difficult question, which has not been touched upon very fully, and is one which I would like to leave with the Council, not only with reference to the ceramic field but to others as well.

Determination of I.S.C.C. Color Names for All Samples of Maerz and Paul "Dictionary of Color"

I am pleased to hear that this project is under way and is expected to be carried to completion. The usefulness of the I.S.C.C. system will certainly be enhanced through availability of interchangeable notation. We have found in our own work that the Maerz and Paul Dictionary is of material service as a practical working means of transmitting color descriptions by telephone or wire. The availability of I.S.C.C. system designations will also make the Dictionary of even greater usefulness over a long term.

Development of Color Tolerances for Ceramic Products

This subject is one which is very important to all those engaged in actual industrial work with ceramic colors. There is the greatest variance of usage and opinion on color tolerances. On the one hand, some users tolerate such large differences in ceramic ware (e.g., dinnerware) that consumers attempting to replace broken pieces in sets cannot fail to get a most unfavorable reaction to ceramic ware in general when they get replacements having color differences which are positively glaring compared to originals. On the other hand, some users swing to the opposite extreme and specify to such close tolerances that much waste and heavy needless expense is incurred. There is the utmost need for a sane set of practical tolerances for different types of colored articles, which would have enough sanction and acceptance to carry at least a "semiofficial" weight and influence. The largest problem appears to be that of dissemination, publicity, and acceptance by those people whose position involves the passing on color acceptance. These are buyers mainly, both of retail stores and chains, and also buyers for any sort of outlet for manufactured goods. We do not know exactly by what means or how effectively it is possible to reach these individuals and suggest that consideration of this problem is of nearly equal importance to the tolerance method itself.

COORDINATION OF DIMENSIONS OF BUILDING MATERIALS AND EQUIPMENT

Progress Report of American Standards Association Committee A62

A meeting of the Executive Committee of this A.S.A. Committee was held on January 30, 1940, at which the status of the Committee program was discussed. The Committee authorized the preparation and distribution of the following comments as a report to the sectional committee. (This report is dated March 25, 1940.)

(1) Formation of Special Study Committees

The following five special study subcommittees have been organized and are now working: (1) Masonry Made of Structural Clay Products; (2) Wood Doors and Windows; (3) Masonry Made of Concrete and Cast Stone; (4) Metal Windows; and (5) Natural Stones, Including Marble, Granite, and Limestone.

A sixth subcommittee to study the problems of structural wood has been authorized by the Executive Committee and will be organized at an early date.

Personnel of Special Study Committee 1, Masonry Made of Structural Clay Products

Chairman, Harry C. Plummer (Structural Clay Products Inst.), Frederick Heath, Jr. (Colonial Clays, Inc.), Charles W. Hammett (Hammett Co.), E. Philip Schreier (Arch.), Hyman Cunin (USHA), and M. W. Adams (Modular Service Assn.).

(2) Basis for Coordination

The Executive Committee has authorized the formation of the study groups for the purpose of trying out and developing the 4-in. size increment as a basis for coordination. As the work thus far centers around simple masonry walls, the basis for coordination has been restated in terms of a masonry layout unit (see section "Coordination Based on Masonry Layout Unit," p. 123).

As coordination presumes the predetermination of the sizes for structural parts, it also fixes the layout dimensions of the building within certain limits. The coordination is always referred to as a nominal layout of the building. This method of nominal layout is being tried out particularly by the groups studying masonry constructions.

The Executive Committee has decided to start this work on two major problems of coordination, viz., (1) coordination between various types and combinations of masonry walls and (2) coordination of openings in masonry walls with doors and windows to fit in these openings. The work of the study committees has been devoted exclusively to these problems.

Study Committee on Masonry Made of Structural Clay Products (Subcommittee 1)

This committee has been studying the possibility of standardizing brick and tile sizes on a brick, nominally 8 in. long by 4 in. wide and laid three courses to 8 in. To maintain coordination, standardization will be based always on nominal sizes which include the thickness of the mortar joint.

The studies completed have included the application of this brick to ordinary wall layouts and openings in solid 8-in. brick walls and 10-in. cavity walls. Some brief consideration has been given to tile sizes based on these brick sizes. Work is now being started on a more complete analysis of glazed units and of the common brick bonding patterns.

Assembly Details Service for the Industry

The work of the study committees has disclosed that the building industry apparently lacks sound assembly de-

tails that meet the approval of manufacturers, architects, and builders. As the development of such details is a fundamental part of the work of this project, it has been suggested that, by making details of this type available to architects and builders in convenient form and adequate variety, the sectional committee could perform a useful service to the industry. The possibility of such a service is receiving further study.

Meetings

The Executive Committee took no definite decision as to dates for future meetings but believed a meeting would probably be found desirable in the late spring and was of the opinion that progress by the various subcommittees would be sufficient to warrant holding a meeting of the sectional committee early in the fall of 1940.

—H. M. LAWRENCE, *Assistant Secretary, A.S.A. Committee A62*

Coordination Based on Masonry Layout Unit

The theory of coordination has been stated in terms of a size increment. This is the broadest approach for all types of building materials. For those who are primarily interested in masonry, the basis of coordination may be explained more simply as a masonry layout unit.

The coordination of masonry requires that walls and openings in them be laid out in such a way that they can be built out of standard full-size and simple fractional sizes of masonry units. To accomplish this, the layout of walls and openings must be controlled by a suitable layout unit. This unit will include the thickness of the mortar joint as well as the size of the actual masonry brick, tile, or block.

The first requirement of the unit is that it affords the architect a simple means of making his building layout. The unit should be a number of whole inches and a simple fraction of a foot.

Tile sizes are usually built up from brick sizes. Concrete blocks are larger units and must also be commensurate with the brick size. Consequently, the brick length plus the average thickness of one mortar joint would provide a logical layout unit. We designate this total dimension of brick length plus joint thickness as the nominal length of the brick. The average of present practice for ordinary brick is a nominal length of about $8^3/_8$ inches. Such a fractional dimension would obviously be cumbersome and impractical as a basis for building layout. On the other hand, 8 inches would be satisfactory and would involve no appreciable change in the present appearance of brick construction.

As brick is laid in overlapping stretcher courses, the actual layout unit should be half the nominal length of the brick. Thus the layout unit of 4 inches which has been adopted tentatively for this work appears to be the dimension best suited for all types of masonry construction. As brick and other masonry units are used in rowlock, soldier, and end-set positions, the 4-inch unit applies to the vertical layout as well as to the plan of the building.

Because many building materials other than masonry must be included in this basis of coordination, it will be important to select a unit which will necessitate a minimum of change from present practices throughout the building industry. A survey of present standardization in building materials and equipment shows that either 2 or 4 inches are used more widely than any other dimension as a basis for standard sizes. The evidence in favor of a 4-inch layout unit is very convincing.

This layout unit is used to create an approximate or nominal layout for all buildings both in plan and elevation, showing the locations of nominal wall faces and nominal openings. All parallel nominal surfaces, including boundaries of nominal openings, are spaced at multiples of 4 inches. The actual wall surfaces and openings will have some definite position relative to their nominal layout. Such a relationship will be established for each type of construction.

For masonry, actual surfaces are inside of their nominal locations by half the thickness of one mortar joint. Thus actual outside dimensions of masonry, including wall thickness, are less than the nominal by the thickness of one joint. Actual sizes of openings are greater than the nominal by one joint thickness, except that where a sloping masonry sill is used, the lower edge of the opening must be established by arbitrary methods.

Masonry unit sizes will be standardized on a nominal rather than on an actual basis. Various types of masonry and surface textures require different joint thicknesses, and actual unit sizes as standards for each type will differ slightly to compensate for these variations in joint dimensions. This standardization on a nominal basis will permit each type of masonry to be used with the appropriate joint dimension, and either as facing or backup material in any combination, with an assurance of proper coordination.

—M. W. ADAMS, *Secretary, A.S.A. Committee A62*

PHOTOSTATS AND MICROFILMS

The Engineering Societies Library has broadened its services to the engineers of the world by making available at cost not only photostats, but also microfilm copies of material contained in the 160,000 volumes and thousands of periodicals in its collection. Regardless of residence, any engineer, library, or company may order an 11- by 14-inch white-on-black (negative) photostat print on bromide paper at 30 cents each, which charge includes ordinary postage to any part of the world. Black-on-white (positive) prints are supplied by copying a negative print, which makes the cost 30 cents additional. Microfilm copies on 35-mm. film are available at a cost of four cents per exposure (usually one page), with a minimum charge of $1.25 per volume.

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For the benefit of those who can come to the Library in person, a trained and courteous staff stands ready to assist them in their problems. Despite the fact that it is the official library of national engineering societies, all books and periodicals of the Library are available for the free use of the public during regular hours. If a translation or list of references on any particular subject is desired, the Library staff will prepare this at cost. For those wishing to photograph any material in the Library, a photographic copying stand, complete with table and electric lights, is available for use with the visitor's own camera.

The Library is a joint cooperative enterprise of the American Society of Civil Engineers, American Institute of Mining and Metallurgical Engineers, American Society of Mechanical Engineers, and the American Institute of Electrical Engineers. It is located at 29 West 39th St., New York, N. Y.

CENTRAL DISTRICT ENAMELERS' CLUB

The second dinner meeting of the 1940 season of the Central District Enamelers' Club was held on March 15 at the Hotel Carter, Cleveland, Ohio. The following papers were presented:

(1) "Nepheline Syenite, Its Properties and Uses, Particularly as Applied to Porcelain Enamel," by C. J. Koenig, research engineer, Great Lakes Foundry Sand Co., Detroit, Mich.

(2) "Inspection, Packing, and Field Problems," by R. F. Bisbee, chief inspector, Westinghouse Electric & Mfg. Co., Mansfield, Ohio.

—G. E. PFLEGER, *Secretary-Treasurer*

MEETING OF INDUSTRIAL LIBRARIANS

Ceramic engineering and chemical librarians, abstracters, bibliographers, and literature searchers of various manufacturing and technical companies throughout the United States and Canada will meet at the Claypool Hotel, Indianapolis, Ind., June 3 to 6, during the thirty-second annual conference of the Special Libraries Association. Ross C. Cibella, a graduate of the New York State College of Ceramics, is Chairman of the group.

E. J. Crane, editor of *Chemical Abstracts*, will speak on "The Abstracting of Articles from the Scientific Viewpoint." The address will be delivered at the hotel at 2:00 P.M. on June 4.

The Science-Technology Group, formed in 1924, has grown steadily from a very small number to a membership of approximately 700. Each chapter of the Special Libraries Association has its local representatives of the group who are actively engaged in disseminating information to local members and to the companies by whom they are employed. Among the group publications are "Trade Name Index" and "Subject Headings for Chemical Libraries."

MEETING OF AMERICAN ASSOCIATION OF INDUSTRIAL PHYSICIANS AND SURGEONS

The Twenty-Fifth Annual Meeting of the American Association of Industrial Physicians and Surgeons, together with the First Annual Meeting of the American Industrial Hygiene Association, will be held at the Hotel Pennsylvania, New York, N. Y., June 4, 5, 6, and 7, 1940. This will be a four-day convention intensively devoted to the problems of industrial health in all of their various medical, technical, and hygienic phases, with particular stress on prevention and control of occupational hazards. Important programs have been prepared, and technical and scientific exhibits will be a feature of the meeting. The dinner on Thursday evening, June 6, will be the occasion of the presentation of the W. S. Knudsen Award for the year of 1939–1940. All who have an interest in these phases of industrial health, including industrial hygienists, safety engineers, chemists, plant engineers, and personnel managers, are urged to attend as this program will have unusual value to all these groups.

—A. D. Cloud, *Managing Editor, Industrial Medicine*

EXPLOSIVES FOR MINING

The use of explosives in mining, with its attendant hazards and the program of scientific research that has succeeded in developing safer types of explosives for use underground were the subject of a lecture given at the University of Maryland, College Park, Md., on March 26 by Wilbert J. Huff, consulting explosives chemist of the Bureau of Mines, Department of the Interior. Interesting experiments, showing the behavior of a number of well-known explosive compounds, were made by Dr. Huff. The lecture was illustrated with moving pictures and lantern slides explaining how fires and mine explosions may be caused by explosives.

CONTEMPORARY AMERICAN INDUSTRIAL ART FOR 1940

Since their inauguration in 1917, the Metropolitan Museum's exhibitions of industrial art have reflected the changing conditions and caliber of American design. The most important in the series have been the comprehensive displays of house furnishings. The 1940 exhibition opened on April 16. The room schemes shown included four living rooms, a porch, a dining alcove, a library corner, two children's rooms, a terrace, entrance halls of a penthouse and a country house, a music room, and an outdoor living room. Four groups of exhibits were arranged by materials, namely, one of metals and glass; another of ceramics, glass, and plastics; a third of wood; and finally one of metals and synthetic fabrics. (Excerpts reprinted with permission from the *Bulletin of the Metropolitan Museum of Art.*)

W. H. CULLIMORE, SECRETARY, NATIONAL PAVING BRICK ASSOCIATION

William H. Cullimore has been appointed to serve as engineer and secretary to the National Paving Brick Association to succeed the late George F. Schlesinger. Mr. Cullimore has resigned his position as associate engineer

W. H. Cullimore

of the Department of Public Works of the City of Baltimore. He was born in Baltimore, Md., and was educated in the public schools of that city. He was graduated from the Baltimore Polytechnic Institute in 1918 and completed two years in the civil engineering course at Johns Hopkins University.

GAMES SLAYTER AWARDED LONGSTRETH MEDAL BY FRANKLIN INSTITUTE

On May 15, Mr. Slayter was awarded an Edward Longstreth Medal during the annual Medal Day exercises of the Franklin Institute. The Medal is given, "in recognition of meritorious work in science and the industrial arts," on the recommendation of the Institute's Committee on Science and the Arts.

Mr. Slayter is vice-president of Owens-Corning Fiberglas Corporation, Toledo, Ohio, and is in charge of research and development. At least eight principal United States patents in the Fiberglas field have been issued in his name. He also received the award of "Modern Pioneer" on February 21 (see *The Bulletin*, p. 106, March issue).

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FRANKLIN INSTITUTE AWARDS

The Franklin Institute has previously awarded four medals to scientists in the glass field. The first was received by Michael J. Owens, who invented the first bottle-making machine, patented in 1895. Mr. Owens was awarded the Elliott Cresson Medal of the Institute in 1915.

The second medal in the glass field was jointly received by L. H. Adams and E. D. Williamson of the Geophysical Laboratory, Washington, D. C. These two men were awarded the Longstreth Medal in 1921 for their work on the annealing of glass.

Eugene C. Sullivan and William C. Taylor of the Corning Glass Works were awarded the Howard N. Potts Medal by the Institute in 1926 for their work on the composition of superresistant glasses. The last scientist in the glass field to receive a medal, previous to Mr. Slayter, was John C. Hostetter of the Corning Glass Works who, in 1937, was awarded the Potts Medal for his contributions to the technology of glass. Dr. Hostetter has since become a vice-president of the Hartford-Empire Glass Company.

Battelle Memorial Institute Ceramic Research Staff Additions

S. L. Santomieri

E. M. Lannes

CHICAGO VITREOUS DEMONSTRATES IMPROVED ARCHITECTURAL PORCELAIN ENAMEL FOR INTERIORS

Vast strides have been made in the improvement of architectural porcelain enamel for building purposes. Although introduced about ten years ago, the many possibilities of this unusual material have only begun to be thoroughly appreciated. Tens of thousands of stores, service stations, and other types of buildings have been successfully and attractively finished with this durable, colorful material.

Another recent development is the application of porcelain enamel for interior finishing. The Chicago Vitreous Enamel Product Company installed approximately 13,000 square feet of porcelain enamel in their research and testing laboratories, erected in 1935 (see *The Bulletin*, **14** [12] 404 (1935)).

Alterations to their main offices have now been made, using architectural porcelain enamel. In contrast, however, to the type of construction employed in the Company's laboratories, the latest method of handling provides a clean unbroken surface of porcelain enamel without the use of attachment strips or other earlier methods of fastening panels to walls and ceilings.

In the laboratories, the porcelain-enameled wall panels were made of comparatively light-gauge metal without flanges on those edges covered by attachment strips. In this earlier type of construction, the panels were backed up with insulation board, and this process was adopted to insure an insulated and flat unit.

In the new installations, no attachment strips are employed, and the flanges of the panels are slotted and hung to furring strips by means of concealed hooks. The panels

were fabricated from 18-gauge metal to which an insulation board was veneered under high pressure together with a light-gauge galvanized metal backing, making a flat rigid building unit.

All of the rooms, by virtue of their easy-to-clean porcelain-enameled surfaces, have reduced maintenance to a minimum.

Although the designs of the various rooms are somewhat more elaborate than might be installed in the offices of an average manufacturing plant, they serve to demonstrate the use of porcelain enamel for any type of modern building and associate it with the finer building materials.

FIG. 1.—Looking through the entrance into the new reception room at Chicago Vitreous. Architectural porcelain enamel has been used in combination with other materials to create a pleasing effect; the receptionist compartment is finished with shining black porcelain enamel topped with clear glass panels set in bronze, and the back wall is finished in calfskin brown which blends well with ivory porcelain-enameled panels on either side. The molded glass is set in bronze frames and provides adequate lighting for a corridor behind it but does not permit clear vision. The floor, in harmony with other colors in the room, is terrazzo with bronze detail insets.

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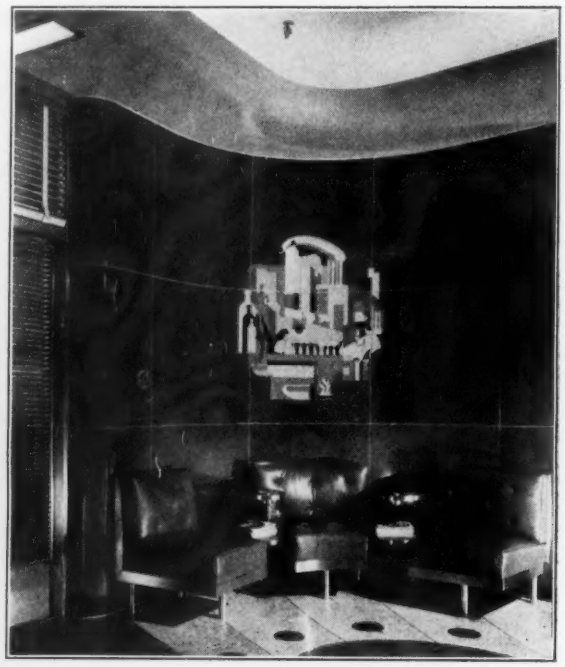

FIG. 2.—A corner of Chicago Vitreous reception room. A feature of this wall section of architectural porcelain enamel is a seven-color mural permanently fired into the maple green surface in which a research motif is carried out. The wall panels are fabricated to form a compounded curve and the furniture is fitted to this contour. Seats are covered with leather and trimmed with bronze.

FIG. 3.—In the women's room at Chicago Vitreous, the predominating wall color is gray in architectural porcelain enamel with the area beneath the mirrors in a delicate peach tone. The horizontal burgundy stripes and burgundy lavatories provide a pleasing contrast for this peach background. Hand driers are cast-iron porcelain enameled in a matching gray.

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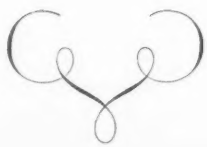

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Ceramic Color & Chemical Mfg. Co.
The Hommel Co., O., Inc.
Industrial Ceramic Products, Inc.
Ingram-Richardson Mfg. Co. of Indiana, Inc.
McDanel Refractory Porcelain Co.
The Vitro Mfg. Co.

Ball Mills (Laboratory Type)
Ceramic Color & Chemical Mfg. Co.
Chicago Vitreous Enamel Product Co.
Denver Fire Clay Co.
Drakenfeld, B. F., & Co.
The Hommel Co., O., Inc.
Ingram-Richardson Mfg. Co. of Indiana, Inc.
The Vitro Mfg. Co.

Barium Carbonate
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Edgar Plastic Kaolin Co.
Foote Mineral Co.
Hammill & Gillespie, Inc.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
The Vitro Mfg. Co.

Basic Oxides
Porcelain Enamel and Mfg. Co.

Batch Systems
Frazier-Simplex, Inc.
Lancaster Iron Works, Inc.
National Engineering Co.

Batts
Carborundum Co. (*"Carbofrax Aloxite"*)
Denver Fire Clay Co.
Norton Co. (*Alundum-Crystolon*)

Beryl
Foote Mineral Co.

Bichromate of Soda
Harshaw Chemical Co.
The Hommel Co., O., Inc.

Bitstone
Potters Supply Co.

Blocks (Refractory)
Carborundum Co.
Corhart Refractories Co.
Denver Fire Clay Co.
Louthan Mfg. Co.
Norton Co.
The Vitro Mfg. Co.

Body Stains
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
The Hommel Co., O., Inc.

Bone Ash
Denver Fire Clay Co.
Harshaw Chemical Co.
The Hommel Co., O., Inc.

Borax
American Potash & Chemical Co.
Denver Fire Clay Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
Pacific Coast Borax Co.
The Vitro Mfg. Co.

Borax Glass
American Potash and Chemical Corp.
Ceramic Color & Chemical Mfg. Co.
Denver Fire Clay Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
Pacific Coast Borax Co.
The Vitro Mfg. Co.

Boric Acid (Anhydrous)
Denver Fire Clay Co.
Drakenfeld, B. F., & Co.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
Pacific Coast Borax Co.
The Vitro Mfg. Co.

Boric Acid (Crystal, Granular, or Powder)
American Potash & Chemical Corp.
Ceramic Color & Chemical Mfg. Co.
Denver Fire Clay Co.
Drakenfeld, B. F., & Co.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
Pacific Coast Borax Co.
The Vitro Mfg. Co.

Boron Carbide
Norton Co.

Brick Machines (also Barrows, Molds)
Industrial Ceramic Products, Inc.
Lancaster Iron Works, Inc.

Brick (Refractory)
Carborundum Co. (*"Carbofrax Aloxite"*)
Corhart Refractories Co.
Denver Fire Clay Co.
Norton Co.
The Vitro Mfg. Co.

Cadmium Sulphide
Drakenfeld, B. F., & Co.
Harshaw Chemical Co.
The Hommel Co., O., Inc.

Carbofrax (Refractory Products)
Carborundum Co.

Carbonates (Barium, Lead)
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Edgar Plastic Kaolin Co.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
The Vitro Mfg. Co.

Castings
Industrial Ceramic Products, Inc.
Lancaster Iron Works, Inc.

Castings (Abrasive Resisting)
Bethlehem Steel Co.

Caustic Potash
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
Solvay Sales Corp.

Caustic Soda
Ceramic Color & Chemical Mfg. Co.
Denver Fire Clay Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
Pennsylvania Salt Mfg. Co.
Solvay Sales Corp.
The Vitro Mfg. Co.

Cements
Carborundum Co.
Corhart Refractories Co.
Norton Co.
Pennsylvania Salt Mfg. Co.

Ceramic Chemicals
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
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Harshaw Chemical Co.
The Hommel Co., O., Inc.
Metal & Thermit Corp.
Pennsylvania Salt Mfg. Co.
Porcelain Enamel and Mfg. Co.
The Vitro Mfg. Co.

Cerium Oxide
Drakenfeld, B. F., & Co.
Foote Mineral Co.

Chromite (Natural Chromate of Iron)
Foote Mineral Co.

Chromium Oxide
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
Porcelain Enamel and Mfg. Co.
The Vitro Mfg. Co.

Clay (Ball)
Ceramic Color & Chemical Mfg. Co.
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Hammill & Gillespie, Inc.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
Kentucky Clay Mining Co.
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Paper Makers Importing Co.
Potters Supply Co.
Spinks, H. C., Clay Co.
The Vitro Mfg. Co.
United Clay Mines Corp.

Clay (Bentonite)
American Colloid Co.
Edgar Plastic Kaolin Co.
Great Lakes Foundry Sand Co.

Clay (Block)
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.

Clay (China)
Ceramic Color & Chemical Mfg. Co.
Hammill & Gillespie, Inc.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
Maxson, Elwyn L.
Paper Makers Importing Co.
Thomas Alabama Kaolin Co.
The Vitro Mfg. Co.
United Clay Mines Corp.

Clay—Cleaners, Feeders
Lancaster Iron Works, Inc.

Clay (Electrical, Porcelain)
Ceramic Color & Chemical Mfg. Co.
Edgar Plastic Kaolin Co.
Hammill & Gillespie, Inc.
The Hommel Co., O., Inc.
Kentucky Clay Mining Co.
Maxson, Elwyn L.
Paper Makers Importing Co.
Spinks, H. C., Clay Co.
Thomas Alabama Kaolin Co.
United Clay Mines Corp.

Clay (Enamel)
Ceramic Color & Chemical Mfg. Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Hammill & Gillespie, Inc.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
Ingram-Richardson Mfg. Co. of Indiana, Inc.
Kentucky Clay Mining Co.
Maxson, Elwyn L.
Metal & Thermit Corp.
Paper Makers Importing Co.
Porcelain Enamel and Mfg. Co.
Spinks, H. C., Clay Co.
Thomas Alabama Kaolin Co.
The Vitro Mfg. Co.
United Clay Mines Corp.

Clay (Fire)
Denver Fire Clay Co.
Great Lakes Foundry Sand Co.
Maxson, Elwyn L.
Paper Makers Importing Co.
Potters Supply Co.
Thomas Alabama Kaolin Co.
United Clay Mines Co.

Clay (German Vallendar)
Ceramic Color & Chemical Mfg. Co.
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Porcelain Enamel and Mfg. Co.

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Edgar Plastic Kaolin Co.
Great Lakes Foundry Sand Co.
Maxson, Elwyn L.
Paper Makers Importing Co.
Spinks, H. C., Clay Co.
Thomas Alabama Kaolin Co.
United Clay Mines Corp.

Clay (Potters)
Denver Fire Clay Co.
Hammill & Gillespie, Inc.
The Hommel Co., O., Inc.
Kentucky Clay Mining Co.
Maxson, Elwyn L.
Paper Makers Importing Co.
Spinks, H. C., Clay Co.
Thomas Alabama Kaolin Co.
United Clay Mines Corp.

Clay (Process Equipment)
Industrial Ceramic Products, Inc.
Lancaster Iron Works, Inc.
National Engineering Co.

Clay (Sagger)
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Great Lakes Foundry Sand Co.
The Hommel Co., O., Inc.
Kentucky Clay Mining Co.
Maxson, Elwyn L.
Paper Makers Importing Co.
Potters Supply Co.
Spinks, H. C., Clay Co.
Thomas Alabama Kaolin Co.
United Clay Mines Corp.

Clay-Slip (Albany)
Hammill & Gillespie, Inc.
United Clay Mines Corp.

Clay (Wad)
Kentucky Clay Mining Co.
Potters Supply Co.
Spinks, H. C., Clay Co.
Thomas Alabama Kaolin Co.
United Clay Mines Corp.

Clay (Wall Tile)
Edgar Plastic Kaolin Co.
Hammill & Gillespie, Inc.
Kentucky Clay Mining Co.
Maxson, Elwyn L.
Paper Makers Importing Co.
Spinks, H. C., Clay Co.
Thomas Alabama Kaolin Co.
United Clay Mines Corp.

Cleaners
Pennsylvania Salt Mfg. Co.
Porcelain Enamel and Mfg. Co.

Cleaners, Chemical
Harshaw Chemical Co.
Pennsylvania Salt Mfg. Co.

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Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
Ingram-Richardson Mfg. Co. of Indiana, Inc.
Porcelain Enamel and Mfg. Co.
The Vitro Mfg. Co.

Cobalt Sulphate
Drakenfeld, B. F., & Co.
Harshaw Chemical Co.
The Hommel Co., O., Inc.

Colors
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
Ingram-Richardson Mfg. Co. of Indiana, Inc.
Porcelain Enamel and Mfg. Co.
The Vitro Mfg. Co.

Cones
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National Engineering Co.

Copper Oxide
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Harshaw Chemical Co.
The Hommel Co., O., Inc.

Corhart
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Harshaw Chemical Co.
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Maxson, Elwyn L.
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Harshaw Chemical Co.
The Hommel Co., O., Inc.
Pennsylvania Salt Mfg. Co.
The Vitro Mfg. Co.

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Norton Co.

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The Hommel Co., O., Inc.
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Kux-Lohner Machine Company

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Corhart Refractories Co.

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Porcelain Enamel and Mfg. Co.

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Frazier-Simplex, Inc.
The Hommel Co., O., Inc.
Ingram-Richardson Mfg. Co. of Indiana, Inc.
The Vitro Mfg. Co.

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Carborundum Co.
Ceramic Color & Chemical Mfg. Co.
The Hommel Co., O., Inc.
Ingram-Richardson Mfg. Co. of Indiana, Inc.
Lancaster Iron Works, Inc.
Norton Co.

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American Rolling Mill Co.
Bethlehem Steel Co.

Enameling Muffles
Bethlehem Steel Co.
Carborundum Co. (*Carbofrax*)
Frazier-Simplex, Inc.
Ingram-Richardson Mfg. Co. of Indiana, Inc.
Norton Co. (*Alundum*)

Enameling (Practical Service)
Ceramic Color & Chemical Mfg. Co.
The Hommel Co., O., Inc.
Ingram-Richardson Mfg. Co. of Indiana, Inc.
Metal & Thermit Corp.
Porcelain Enamel and Mfg. Co.
The Vitro Mfg. Co.

Enamels
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
Ingram-Richardson Mfg. Co. of Indiana, Inc.
Porcelain Enamel and Mfg. Co.
The Vitro Mfg. Co.

Enamel Oxide
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.

Enamels (Porcelain)
Ceramic Color & Chemical Mfg. Co.
The Hommel Co., O., Inc.
Ingram-Richardson Mfg. Co. of Indiana, Inc.
Porcelain Enamel and Mfg. Co.
The Vitro Mfg. Co.

Equipment (Porcelain Enameling)
Ceramic Color & Chemical Mfg. Co.
The DeVilbiss Co.
The Hommel Co., O., Inc.
Ingram-Richardson Mfg. Co. of Indiana, Inc.

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Corhart Refractories Co.
Denver Fire Clay Co.
Norton Co.

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Lancaster Iron Works, Inc.

Fire Clay
Denver Fire Clay Co.
Great Lakes Foundry Sand Co.
Spinks, H. C., Clay Co.
Thomas Alabama Kaolin Co.

Flint
Ceramic Color & Chemical Mfg. Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Great Lakes Foundry Sand Co.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
Maxson, Elwyn L.
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Porcelain Enamel and Mfg. Co.

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Ingram-Richardson Mfg. Co. of Indiana, Inc.
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Norton Co.

Fluorspar
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The Hommel Co., O., Inc.

French Flint
Maxson, Elwyn L.
Paper Makers Importing Co.

Frit
Ceramic Color & Chemical Mfg. Co.
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Ingram-Richardson Mfg. Co. of Indiana, Inc.
Porcelain Enamel and Mfg. Co.
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Harshaw Chemical Co.
The Hommel Co., O., Inc.

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Furnaces
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Frazier-Simplex, Inc.
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Furnaces, Enameling
Swindell-Dressler Corp.

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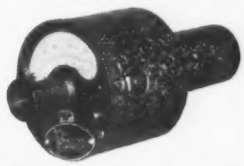

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The Hommel Co., O., Inc.

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Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.
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Harshaw Chemical Co.
The Hommel Co., O., Inc.
The Vitro Mfg. Co.

Gold Decorations
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The Hommel Co., O., Inc.

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Norton Co. (*Crystolon*)

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Norton Co.

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The Hommel Co., O., Inc.

Iron Chromite
Edgar Plastic Kaolin Co.
Harshaw Chemical Co.

Iron (Enameling)
American Rolling Mill Co.
Bethlehem Steel Co.

Iron Oxide
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Edgar Plastic Kaolin Co.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
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The Vitro Mfg. Co.

Kaolin
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Edgar Plastic Kaolin Co.
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Harshaw Chemical Co.
The Hommel Co., O., Inc.
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Paper Makers Importing Co.
Thomas Alabama Kaolin Co.
United Clay Mines Corp.
The Vitro Mfg. Co.

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Denver Fire Clay Co.
Drakenfeld, B. F., & Co.
Frazier-Simplex, Inc.
The Hommel Co., O., Inc.
Swindell-Dressler Corp.

Kilns- (Electric, Circular, Tunnel)
Swindell-Dressler Corp.

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Louthan Mfg. Co.

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Celo Mines, Inc.

Kryolith (see Cryolite)
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Norton Co.

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Carborundum Co.

Lehrs
Frazier-Simplex, Inc.
Swindell-Dressler Corp.

Lehrs (Electric or Fuel Heated)
Frazier-Simplex, Inc.
Swindell-Dressler Corp.

Lehr Loaders
Frazier-Simplex, Inc.

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Carborundum Co.
Corhart Refractories Co.
Denver Fire Clay Co.
Ingram-Richardson Mfg. Co. of Indiana, Inc.
Norton Co.
The Vitro Mfg. Co.

Lithium Carbonate
Drakenfeld, B. F., & Co.
Edgar Plastic Kaolin Co.
Foote Mineral Co.

Lithium Minerals
Foote Mineral Co.

Loaders (Bucket)
National Engineering Co.

Magnesia (Fused)
Norton Co.

Magnesia (Sintered, Calcined)
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Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
Porcelain Enamel and Mfg. Co.

Magnesite
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Hammill & Gillespie, Inc.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
The Vitro Mfg. Co.

Magnesite Calcined
Foote Mineral Co.
The Hommel Co., O., Inc.

Magnesium Carbonate
Drakenfeld, B. F., & Co.
Harshaw Chemical Co.
The Hommel Co., O., Inc.

Manganese
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Hammill & Gillespie, Inc.
Harshaw Chemical Co.
The Hommel Co., O., Inc.
The Vitro Mfg. Co.

Manganese Dioxide
Drakenfeld, B. F., & Co.
Edgar Plastic Kaolin Co.
Foote Mineral Co.

Manganese (Oxide)
Ceramic Color & Chemical Mfg. Co.
Corhart Refractories Co.
Drakenfeld, B. F., & Co.
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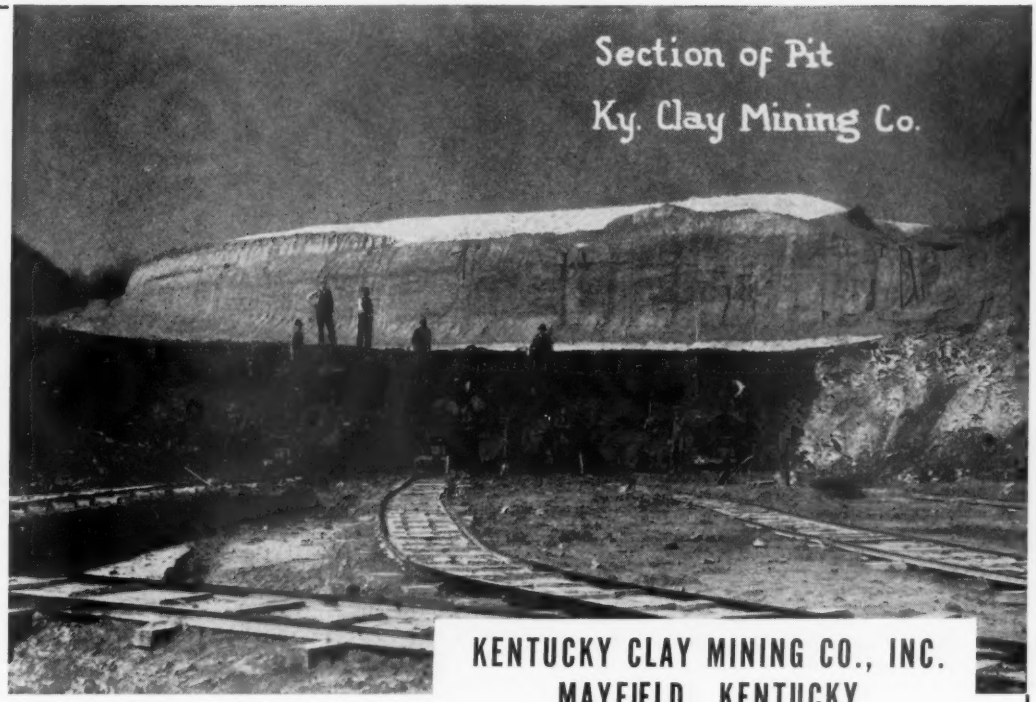

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● We quote from a paper presented at The Fourth Annual Porcelain Enamel Institute Forum, Columbus, Ohio, October 1939.

"...this speaker... has often wondered why of the many (industries), enameling alone does not take advantage of flue gas heat recovery."

We feel the speaker has raised a logical and important question...particularly when it has been proved that such economical recovery can be made easily and simply with equipment having a low first cost and an extremely low maintenance cost as well.

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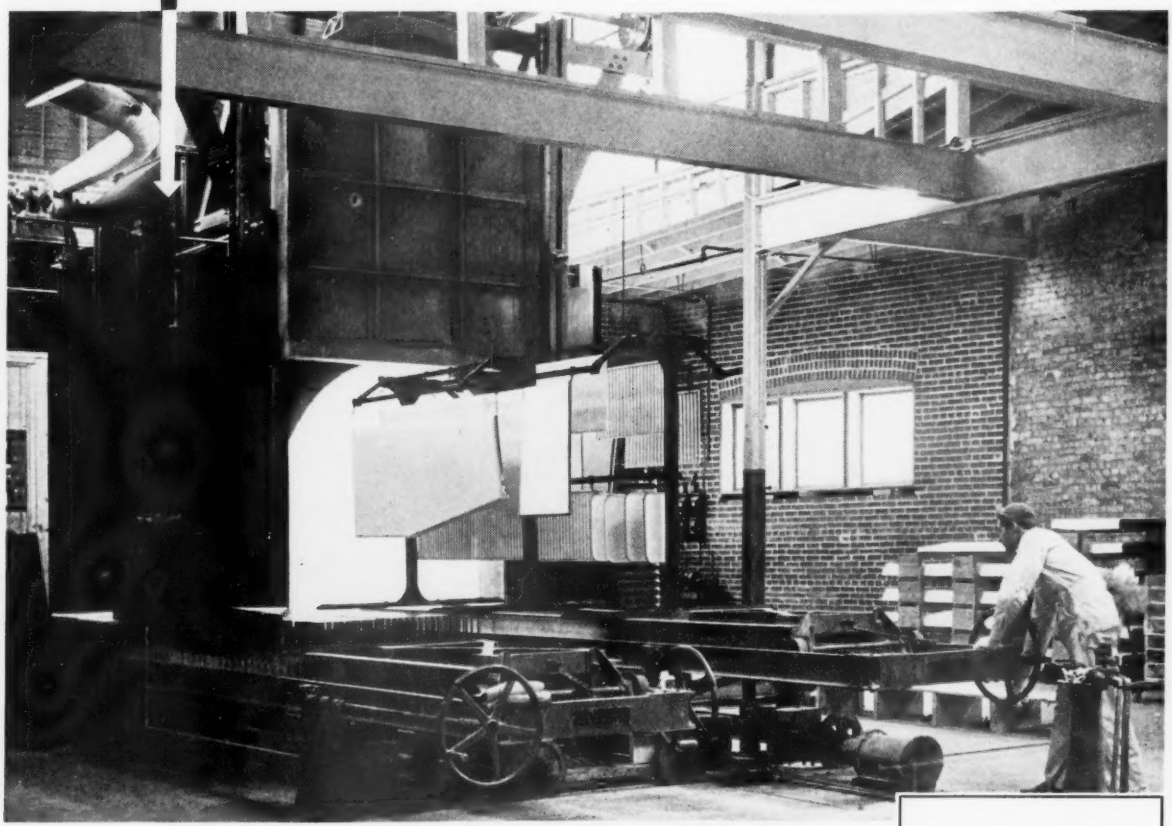

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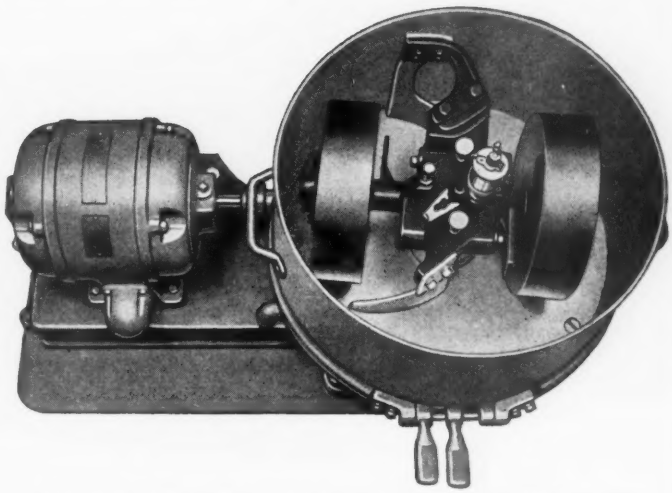

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Mr. Pete Potter
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Dear Pete:

Spring is here at last!! The American Ceramic Society has had a big Meeting in Toronto and I really was surprised at the way Old Man Winter made a comeback up there after the boys from the States had warmed things up around the Royal York, and now the Cincinnati Reds have opened up their ball yard and most of the boys around here are already predicting they will win the pennant again.

Speaking about predictions—I don't know who is going to win the Derby this time, so I am awfully sorry but you will have to do just like I am going to do—go to the track and see.

What I do know is that business is good and everybody is happy and busy around the good old SPINKS clay diggings, and I will predict that things are going to stay that way for the balance of the year. It is hard to beat a pair like CHAMPION & CHALLENGER and JERNIGAN, and their Air-floated stablemate DOUGLAS BALL CLAY.

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